PRICE 50 CENTS

American Machinist

SEPTEMBER 26, 1955

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

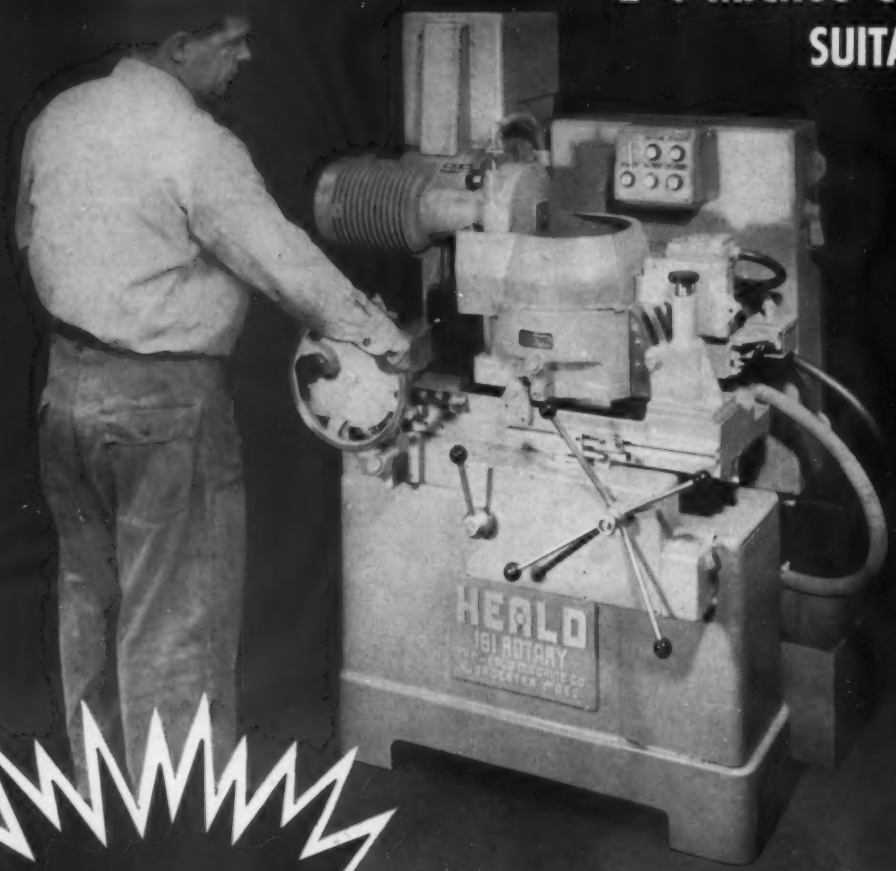
Little 6-spindle bar machine does 100 cpm — see page 2

New Design Dictates Tooling and Techniques

A SPECIAL REPORT

Mist Cooling at Orenda

2-4 MICROS ON SUITABLE WORK



new

HEALD MODEL 161 ROTARY

provides new precision and economy for surface grinding **SMALL PARTS**

- **Manual or Power Reciprocation**
- **Dry or Wet grinding**
- **Simple Mechanical Operation**
- **Grinds Flat, Convex or Concave**
- **Extremely Low Microinch Finish**
- **6" Magnetic Chuck**
- **Extra Rigidity and Weight**
- **More Power to Wheelhead**
- **Column-Type Construction**
- **Moderate Cost**

This completely new column-type Rotary is ideally suited to the general run of small surface grinding work — permitting greater accuracy and better finish than heretofore readily obtainable from equipment of this small size and moderate cost. On display at the Machine Tool Show, the Model 161 consistently turned out hardened steel gear cutters with concave faces ground to a 2-4 microinch finish.

Choice of manual or automatic power table reciprocation permits maximum operating efficiency on individual parts, small lots or long run jobs. Other outstanding features of this compact, versatile surface grinding machine are listed at the left. The bulletin mentioned below will give you the complete story.

Heald also offers two other sizes of high-precision, column-type Rotaries — the Model 261 for medium size work and the big, heavy-duty Model 361 for large work. Information will be gladly sent on request.

For profitable precision finishing on any type of work, IT PAYS TO COME TO HEALD!

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American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index

American Machinist, published bi-weekly, with an additional issue in mid-November, by McGraw-Hill Publishing Company, Inc. James H McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Donald C McGraw, President; Paul Montgomery, Executive Vice President; Joseph A Gerardi, Vice President and Treasurer; John J Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B Smith, Vice President and Editorial Director; Joseph H Allen, Vice President, Director of Advertising; J E Blackburn Jr, Vice President and Circulation Director.

SUBSCRIPTIONS: Address correspondence to American Machinist-Subscription Service, 330 West 42nd Street, New York 36, N Y. Allow one month for change of address. Subscriptions are solicited only from production executives and engineers in the metalworking industries. Position and company connection must be indicated on subscription orders.

Single copies, 50c. Subscription Rates — United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Other Western Hemisphere and the Philippines, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Second-class mail privileges authorized at New York, N. Y.

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NUMBER OF COPIES PRINTED THIS ISSUE 39,084

chips

MULTI-SPINDLE . . . Since WW I, multiple-spindle bar automatics have shown a decided gain — in fact, almost tripling in number, as compared with a 40% gain for all lathes and 46% for single-spindle automatics (*AM* Inventory, 1953). The answer is, of course, the demand for higher production. On our cover is one of the newest of multi-spindle types, the Conomatic TK, 6-spindle, 9/16-in. machine, unusual in that it can handle diameters as small as a phonograph needle at 100 cycles per minute and spindle speeds to 5500 rpm.

SELF RESETTING . . . As we predicted, self-resetting (or "feedback") machine tools were a Show feature. To bring you the latest available data, we describe in this issue the third of the new lathe designs for GE's small-motor lines—the Gisholt unit. This provides an interesting contrast with the other two (*AM*—Mar 14 '55, p 117; Aug 15 '55, p 144). Then there's a very special report of what we considered noteworthy at all three Shows in Chicago.

AUTOMATED ASSEMBLY . . . The electronics industry is leaping into automatic assembly. Our companion magazine, *Electronics*, has made a roundup of methods, and from it we've drawn a tight four pages. Details on placing, feeding, locating, and joining radio and TV parts, printed circuits and part redesign for assembly are included.

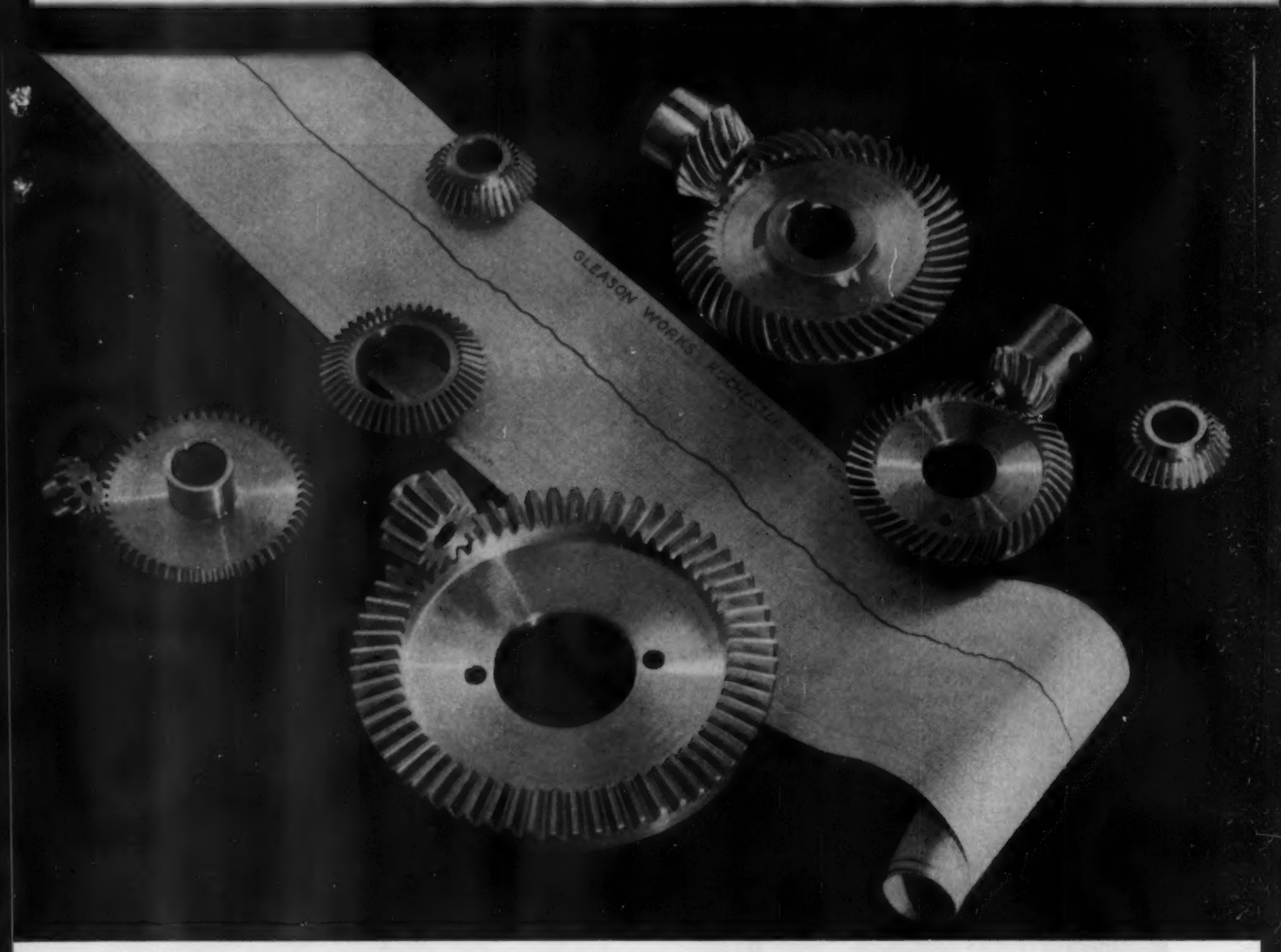
NEW LOOK . . . Associate Editor Stocker journeyed to Binghamton, NY, to see Ansco Camera Works making the new Anscoflex camera, styled by Raymond Loewy. The camera has an all-aluminum body, a high-impact polystyrene interior, and paint outside, has won a number of design awards. Here in 16 pages we tell how tooling and methods were developed for the job.

AUTO-COLLIMATOR . . . Sandia Corp, Albuquerque, NM (how we do get around!) had to check relative rotation of synchromotor and synchrogenerator—or the lag of the motor. J C Moody tells how it was done by mounting accurate polygons with reflecting faces on the shafts. Reflected images of faces were superimposed on the fiducial scale of an auto-collimator, and angular lag can be determined within 10 seconds. Only takes a half hour, too. . . . Another tricky problem was faced at Lees-Bradner—and solved with a Jigmil. Another short article tells all about it.

NATIONWIDE . . . No single area or city can provide you with all the data you need—that's why all of us wear out more shoes than trouser seats. Sources for articles in this issue: NY, NJ, Ohio, NM, Wis, Vt, England, Canada. England is even represented twice — by the first of a series of data sheets on tool and jig design that you'll want to keep and by a delightfully English page on productivity from *The Manchester Guardian*.

COMING . . . Oct 10 *AM* will be our Metal Show Issue. In it we'll bring you a VERY Special Report—on the world's largest job shop, a 24-page study. There'll be stories, too, on radio-frequency interference from machines, high-modulus tool shanks, electrical-discharge die-sinking, shell molding's effects on machining, and others.

MIST COOLER . . . Ernest W Bartle has been special assignments engineer at Orenda Engines Limited, Toronto, for the last 3½ years. He investigates and creates new production methods and the equipment to carry them out. Six years with Orenda, he has previously been chief tool engineer and chief process engineer. Before joining Orenda, he had had two years with Massey-Harris, Canadian farm equipment manufacturer, as chief process engineer. His background also includes 11 years in the automotive industry; seven years as a tool engineer with Chrysler Corp of Canada and four years as a plant engineer with General Motors of Canada. Educated at public and technical schools in Detroit, he's a graduate of the Detroit Institute of Technology. His story on mist-cooling at Orenda heads this issue.



For *the best* in fine pitch gearing . . .

Gleason Works now offers complete production and testing facilities for *any* fine pitch spiral bevel, hypoid, Zerol® or Coniflex® gears.

Bevel gears produced and tested with Gleason equipment assure the highest degree of accuracy obtainable in angular motion transmission. And, with the new methods and improved design incorporated in these Gleason machines, fine pitch gears can be produced at a lower cost than ever before!

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An important new feature of the No. 104 is the provision for recording the rolling test on paper, giving a permanent record of tooth to tooth composite error. An electronic pickup head for a recorder is furnished, and the recorder itself may be engaged or disengaged, as required.

Engineering services available

Cutter sharpeners and complete tooling are available to suit your requirements. In addition, the services of the Gleason Engineering Department are at your disposal, at no obligation to determine the best fine pitch gears for your application and the machinery required to produce them. Write for further information.

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Builders of bevel gear machinery for over 90 years

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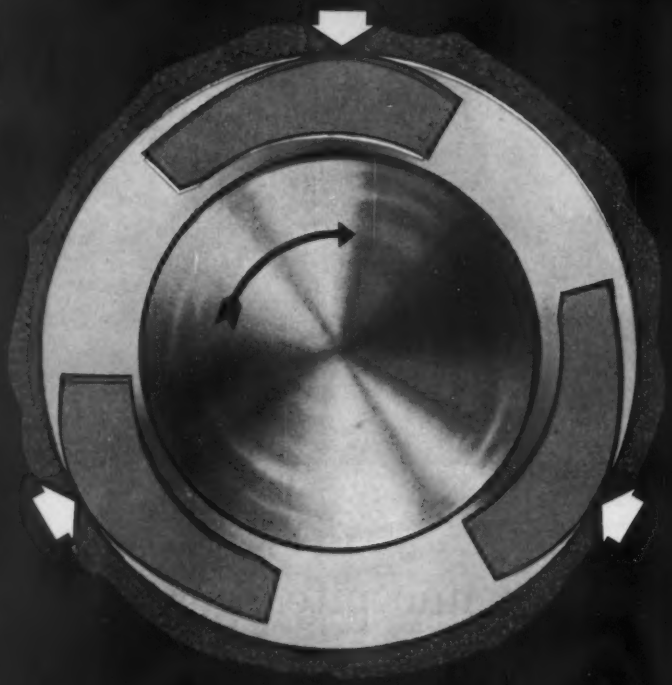
48

Unequaled Attendance Record



CINCINNATI FILMATIC grinding machines are symbolized here.

PLAIN GRINDING MACHINES

UNIVERSAL GRINDING MACHINES

ROLL GRINDING MACHINES

CINCINNATI

OVER 17 YEARS, WITHOUT MISSING ONE SINGLE MINUTE OF THE WORKING DAY!

That's the amazing record of CINCINNATI FILMATIC grinding wheel spindle bearings, a standard feature of Cincinnati centertype and centerless grinding machines. Some of these machines, built 17 or more years ago, are still running, and the grinding wheel spindle bearings have never once required adjustment or maintenance; have never once slowed down or stopped production.

Over 99% of FILMATIC spindle bearings—thousands of them—have compiled this highly desirable cost-reducing record for Cincinnati grinding machines in metalworking shops everywhere.

You can obtain the advantages of FILMATIC spindle bearings by installing Cincinnati precision grinding machines in your shop. Would you like to know more about these bearings? Write for illustrated booklet.

CINCINNATI GRINDERS INCORPORATED
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Space does not permit going into detail about CINCINNATI FILMATIC spindle bearings. The full story, and how they can benefit your shop, is contained in this profusely illustrated booklet. Write for your copy. Ask for publication No. G-604.

CINCINNATI

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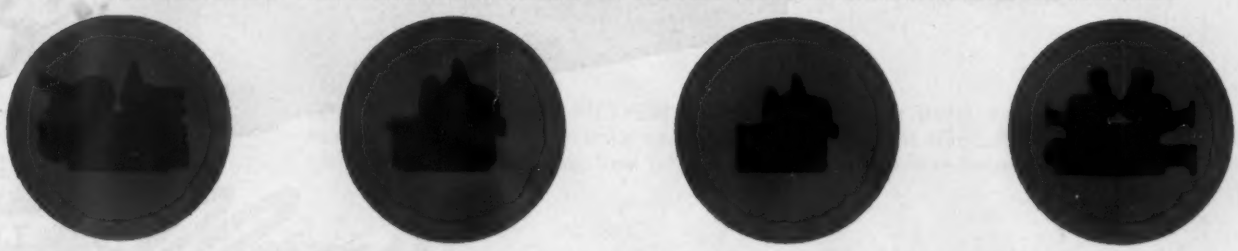
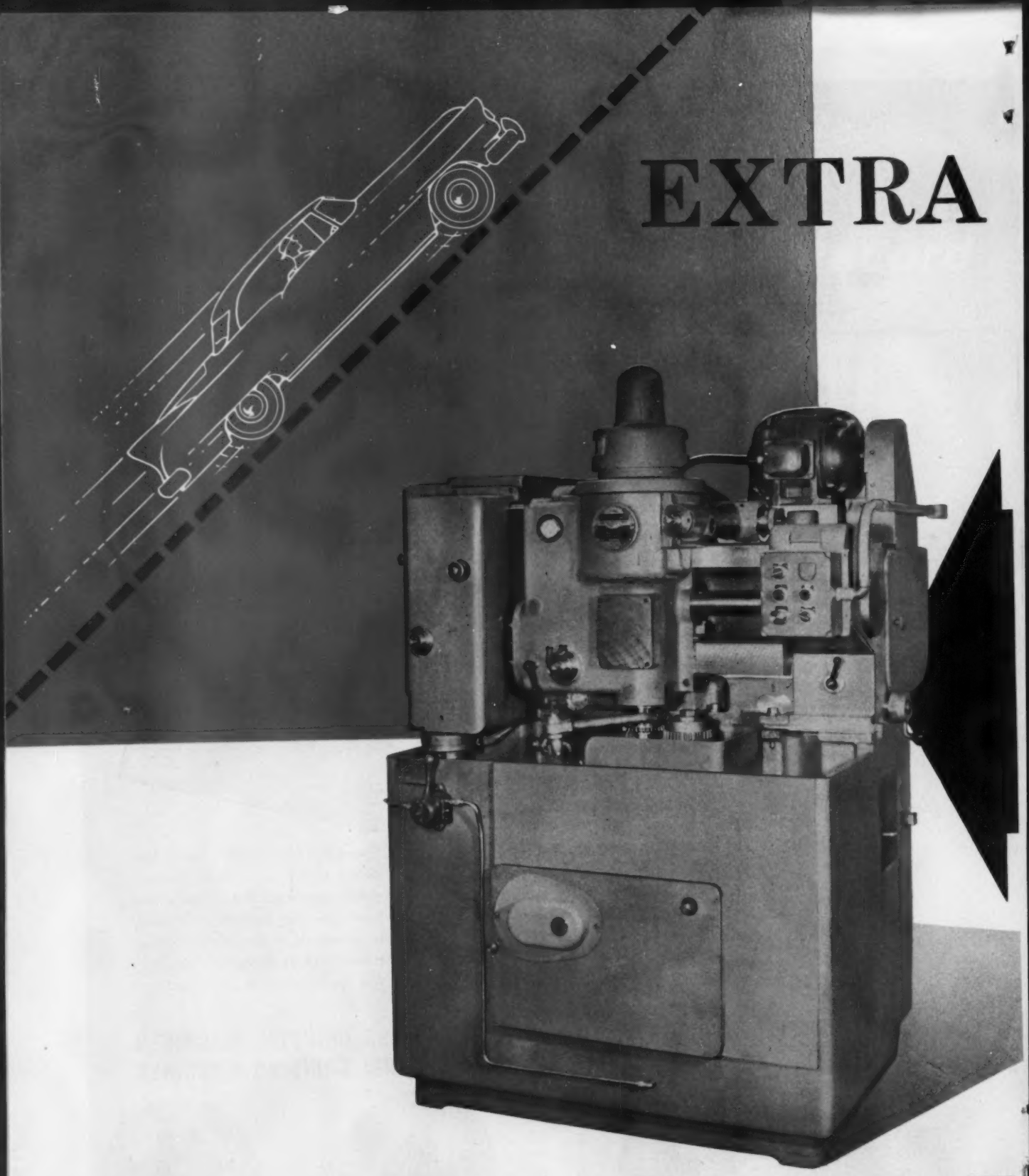
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES



CENTERLESS GRINDING MACHINES | CHUCKING GRINDING MACHINES | MICRO-CENTRIC GRINDING MACHINES | CENTERLESS LAPPING MACHINES

EXTRA



THE
PRECISION
LINE

POWERFUL

...to level off "production peaks"

The Fellows No. 4GS Gear Shaper safeguards your schedules at production peaks– keeps gear costs on the down grade.

Just as you can rely on the extra horsepower in your car when the going gets tough... you can rely on the modern, powerful machine tool to carry your production over peak periods when the schedules are tight.

The All-New Fellows No. 4GS Gear Shaper is a powerful, rigidly constructed machine tool that can remove stock FAST! It can finish-cut gears faster... and within closer tolerances...than ever before.

Look at these features: Rugged drive mechanism to match its 3⅜" cutter spindle! Reciprocating cutter speeds from 98 to 635 strokes per minute! Rotary feeds from 0.008" to 0.024" based upon 4" p.d. cutter! Ideally suited for automatic loading and unloading in the smaller size range...complete production cycle! CAPACITY: 6" p.d. x 2" face!

Recently introduced to industry, the Fellows No. 4GS is setting enviable production records. We invite you to get the complete facts from your Fellows Representative. Ask about the Fellows Plan for deferred payment. Write, wire or phone any Fellows Office.

THE FELLOWS GEAR SHAPER COMPANY, 78 River Street, Springfield, Vermont
Branch Offices: 319 Fisher Building, Detroit 2 • 5835 West North Avenue, Chicago 39
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Fellows *Gear Production Equipment*

If You Do Horizontal, Angular and Vertical Milling

Why Buy Two when ONE VAN NORMAN Ram Type Milling Machine will increase production, . . . cut costs!

Phone, wire or write for complete information about these cost cutting millers.

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export

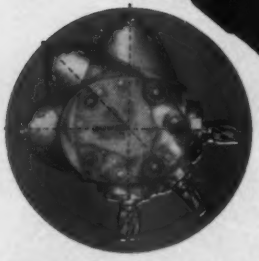
VAN NORMAN

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

NO. 28...

one of 10 new Van Norman Ram Type Millers

TABLE SIZE: 58"x 13"
CUTTERHEAD MOTOR: 7½ H.P.
RAM MOVEMENT: 29"
18 FEEDS; 12 SPEEDS



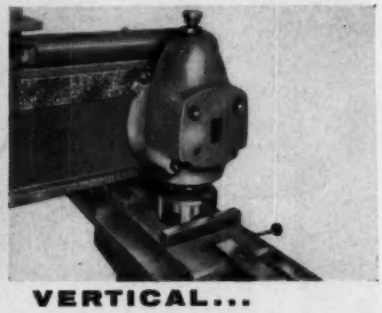
THE ADJUSTABLE CUTTERHEAD PERMITS HORIZONTAL, VERTICAL OR ANGULAR MILLING ON ONE VAN NORMAN MILLER.

HORIZONTAL...

A heavy horizontal milling cut performed on a milling machine ram. The rigidity of machine prevents chatter. Material cast iron; Cutter 8" Carbide Face Mill; Speed 189 rpm; Feed 15 ipm; Depth of cut 3/16"; Width up to 7".

ANGULAR...

An angular milling operation is being performed on a workpiece. Angular range of cutterhead is 0 degrees to 90 degrees. Accurate positioning is simplified by easy-to-read graduations.



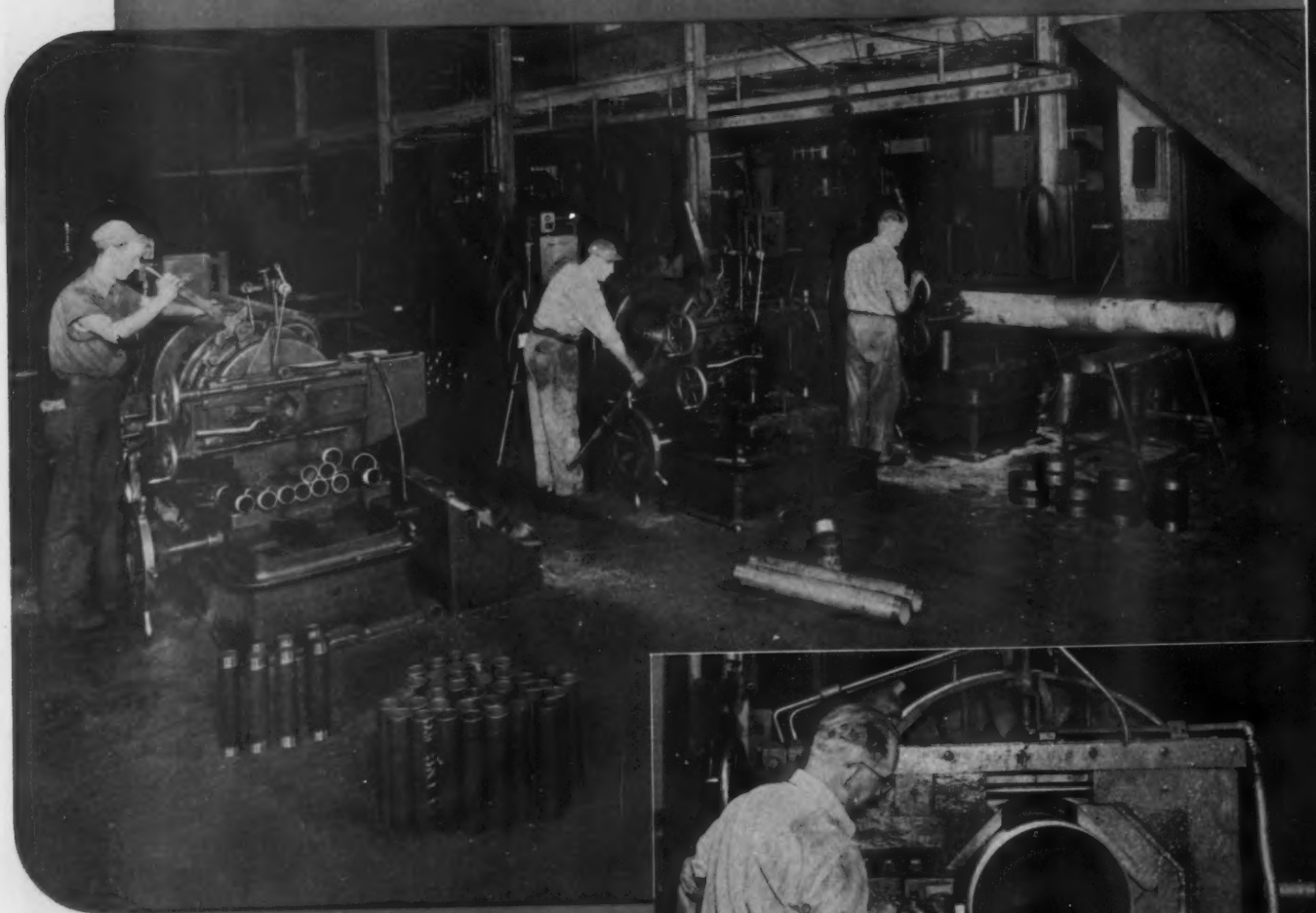
VERTICAL...

With Cutterhead in vertical position, cast iron saddle body is milled with a 6" Carbide Face Mill. A heavy finish cut is made. Speed 267 rpm; Feed 14½ ipm; Depth of cut ¼".

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

LANDIS PIPE ...Four



● *Illustrations feature operations of an installation of LANDIS Pipe Machines in a large Detroit Plant.*

LANDIS

LANDIS Machine

. . . THE WORLD'S LARGEST EXCLUSIVE

THREADING MACHINES

Major Features Increase Efficiency

1. WIDE RANGE

Just three LANDIS Pipe Machines (2", 8" and 18") will thread all diameters of pipe from ½" to 18". Each machine is constructed so as to handle a wide range of pipe sizes—for example, the 6" machine will thread all diameters from 1" to 6". Universal size adjustment allows quick set-up.

2. DIE HEAD EFFICIENCY

The design of Stationary heads provides maximum rigidity on all diameters within their range. Positive locking action is assured through a self-locking toggle joint. Size adjustment is quickly and easily obtained through use of a single locking nut.

3. LOW TOOL COST

Chasers operate at a tangent to the work. Line contact at cutting edge reduces friction. Permanent throat assures even chip distribution. Variable rake affords proper cutting edge for different materials. Landis chasers are useable for 80% of their original length. They are individually replaceable and, within the range of a given die head, a single set of Landis chasers can be used for all diameters of the same pitch, form and taper.

4. PRECISION TAPERED THREADS

The Receding Chaser Pipe Machines are especially designed to cut tapered threads to meet A.P.I. requirements. Chasers recede into the die head at a rate equal to the taper of the thread, ensuring accurate and uniform taper along the full thread length.

LANDIS TOOL COMPANY • WAYNESBORO PENNSYLVANIA

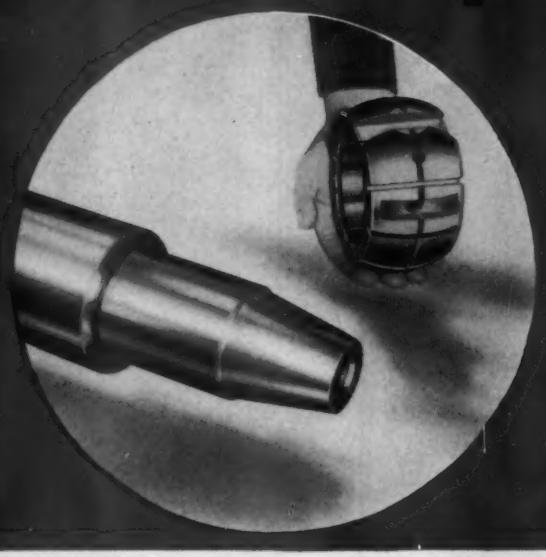
MANUFACTURERS OF THREAD GENERATING EQUIPMENT

Landis 10" x 36" Type CH Plain Grinder

LANDIS

precision grinders

increase operator output



FAST STOCK REMOVAL

"Rigidized" Microsphere bearings and spindles increase production by heavy cuts without loss of finish and accuracy. A Landis exclusive.

SETUP TIME REDUCED

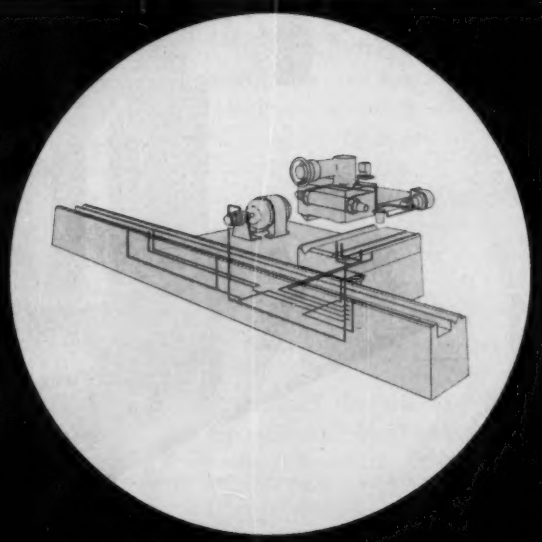
Centralized controls speed setup to give more production time. Controls handy for operator save motion and reduce fatigue.

EYE LEVEL WHEEL FEED

The wheel feed is at eye-level—Easy for operator to watch grinding and wheel feed graduations without moving.

PROTECTED LUBRICATION

Automatic spindle and way lubrication for dependable operation and machine protection. This is a schematic diagram.



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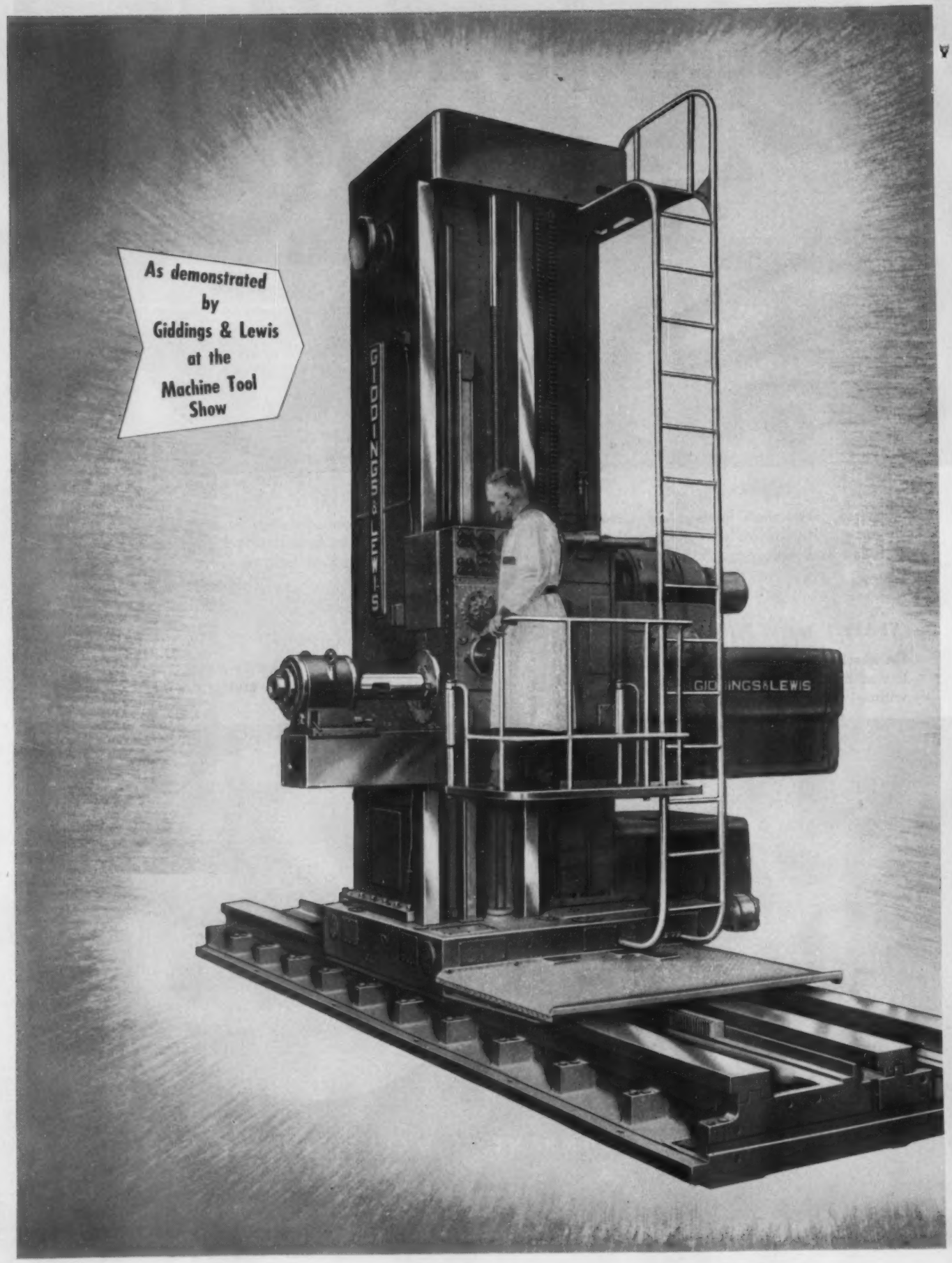

As demonstrated by Giddings & Lewis at the Machine Tool Show
GIDDINGS & LEWIS
GIDDINGS&LEWIS

THE MACHINE WE CALL THE AMAZON...

the ALL-NEW Giddings & Lewis 460-FUAR

HORIZONTAL BORING, DRILLING AND MILLING MACHINE

WHEN you talk machine tools with Giddings & Lewis, you expect "something extra." And if you saw the new 460-FUAR in operation at the Machine Tool Show — you know you get that "something extra" from this machine.

The 460-FUAR is the first in a new line of Giddings & Lewis machines — designated as the 40 Series line — that combines the ultimate in modern design and appearance with a new concept in machine capacity and simplicity of operation.

These new 40 Series Floor Type Horizontal Boring, Drilling and Milling machines are available with a variety of column working heights, runway lengths and with 5" and 6" diameter spindles. The spindle underarm support and a host of other capacity-increasing optional arrangements and accessories are yours for the ordering — according to your specific needs.

The machine's spindle is provided with 32 speeds (3-800 rpm) divided over four different ranges and with 18 feeds for each of the four. You can select various spindle movements with ease — accomplished by push-buttons and finger-tip dials through multiple-disc, hydraulically-actuated clutches. Feeds to the headstock and column are infinite within .5" to 120" per minute.

When equipped with an underarm spindle support (optional) you can perform machining operations beyond the normal range of the machine. It provides that extra-rigidity for the most efficient and accurate operation of angular milling attachments, continuous feed facing heads and face plate drives.

Another profit-making innovation is the special power hoist which enables the operator to handle heavy tools and attachments without waiting for an overhead crane. This feature speeds set-up and production time.

For more information on the outstanding design features of the new 40 Series line, be sure to see your nearest Giddings & Lewis representative. He'll be glad to help you solve your production problems and tell you what this versatile, economical new line of machines can do for you.

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.

cut with confidence . . . **HERE'S THE**

New LeBlond Dual Drive Lathe

NEW LeBLOND DUAL DRIVE

best buy for medium duty turning

More than ever before, LeBlond's new 15" Dual Drive lathe gives you efficient capacity at low cost for the great proportion of your lathe work.

With a single lever, the operator commands a smooth and powerful range of 16 spindle speeds from 31 to 2400 rpm. The proven combination gear-belt drive headstock provides twelve gear-driven low and intermediate speeds; 4 high speeds are driven through a positive Gilmer-type belt that requires no adjustment. The 5 hp motor is ample for all work up to that which requires the power of a heavy duty.

The new bed is rigidly ribbed and is fitted with hardened and ground replaceable steel inserts according to LeBlond's compensating veeway principle for better distribution of cutting forces. Chip pan slides in grooves, is easy to clean out. Precision under load is assured by one-piece apron design and long carriage wings with plenty of bearing. Quick-change box is totally enclosed. The tailstock is the same rugged offset-handwheel type used on all LeBlond heavy duties.

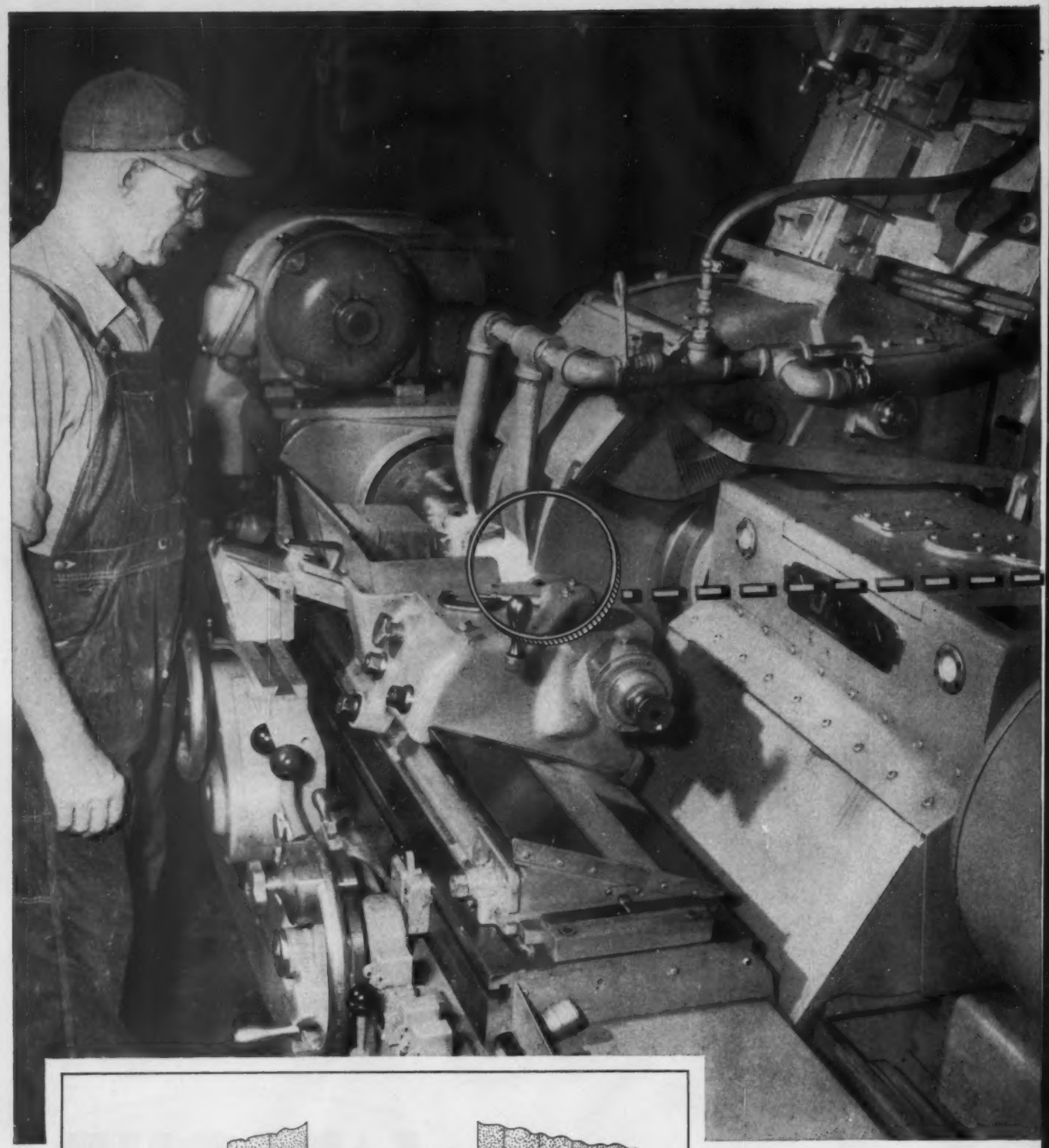
All in all, you'll find the new Dual Drive a very fine, yet moderately-priced machine that will take good care of all but the most unusual requirements. See your nearby LeBlond Distributor or write for Bulletin 6A.

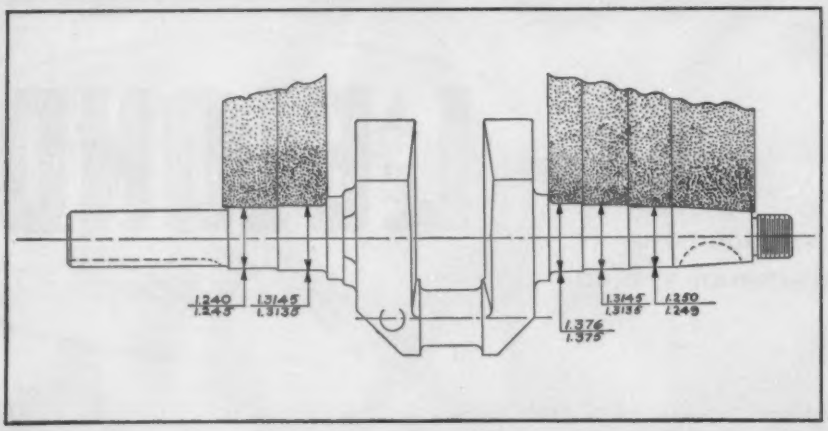
. . . cut with confidence

THE R. K. LEBLOND MACHINE TOOL COMPANY
CINCINNATI 8, OHIO

LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 68 YEARS*

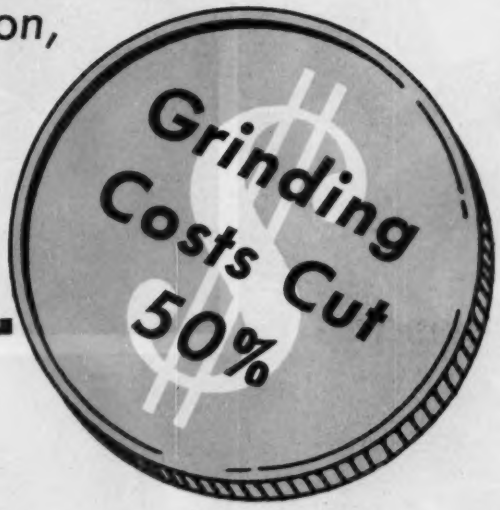




IN WISCONSIN MOTOR CORPORATION'S MILWAUKEE PLANT, crankshafts are ground on a Norton Type CTU-HD 10" semiautomatic heavy duty cylindrical grinder for approximately half what this job formerly cost. Diagram shows six simultaneous grinding operations: two diameters by wheel on left, three diameters and taper by wheel on right.

The "WISCONSIN STORY"...

Wisconsin Motor Corporation, leading manufacturers of heavy duty air-cooled engines, reports:



with this Norton Heavy Duty Grinder

Type CTU-HD machine in Milwaukee plant grinds crankshafts faster and better — at one-half previous cost!

Wisconsin Motor Corporation's endorsement of the Norton Type CTU-HD cylindrical grinder is echoed throughout industry. In plenty of other modern plants this highly advanced, heavy duty machine is doing an outstanding job of boosting production rates and profit margins.

A single 10" Type CTU-HD — or 14" Type LCTU-HD, with increased swing — replaces several separate old-type grinders. It accommodates multiple wheels widely spaced, making it ideal for many plunge cut operations. Or it will take large diameter wheels, essential on such jobs as grinding crankshaft bearings, in order to permit adequate wheel wear before interference with parts of the work.

Semiautomatic or Plain

The semiautomatic arrangement provides an adjustable, automatic grinding cycle under one-lever control. The operator merely loads and unloads, and so can handle more than one machine. Except for this feature the plain machine is identical, and both machines are arranged for fast traverse grinding.

Simplified Operation and Maintenance

All controls for feeds and speeds are set in front of machine. Wheel feed is by a precise revolving screw mechanism with click-count index, by which settings for .0001" in work diameter reduction can be made instantly, without visual check. Controls of work rotation and coolant flow are automatic. Pumps, motors, filters, relief valves, ways lubricant control valves are all outside, for easy maintenance.

For Complete Details

see your Norton Representative or write us direct. And remember: only Norton offers you such long experience in both grinding machines and wheels — your assurance of the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

***To Economize, Modernize with* NEW**

NORTON

GRINDERS and LAPPERS

Making better products... to make your products better

District Sales Offices: Worcester • Hartford • New York Area, Teterboro, New Jersey • Cleveland • Chicago • Detroit

Bigger output less tool wear

. . . fewer rejects lower costs when you do the job with MX

the freer-machining screw stock

THE increased production, the longer tool life, the smoother finish and the greater accuracy you can obtain with USS MX Free-Machining Steel all combine to pay off in *lower costs per part.*

USS MX has so consistently out-performed ordinary screw stock that we can tell you with complete confidence that MX will cut the cost of *any* part you now machine from regular Bessemer grades. (You can prove this for yourself by giving MX a trial on your own machines.)

In the hundreds of cases on which we have reports, cutting speeds with USS MX have been increased as much as 50%. Tools have lasted up to 200% longer. Boosts in output have averaged about 40%, range from 10% to 50%.

That's because USS MX works *with* your tools, not against them. USS MX was designed to ensure maximum cutting speeds compatible with economical tool life, and that's exactly what it does. As a result, production goes up and costs come down wherever you put free-cutting MX to work. What's more, the parts you make are *better* parts.

And here's another reason why USS MX is your best buy today. Despite the fact that it *costs no more* than ordinary screw stock USS MX *has been successfully machined at speeds approaching 350 SFM* — speeds far higher than the *average* (under 250 SFM) used in most shops today.

Furthermore the recent introduction of USS MX *Open-Hearth* Steels now gives you a choice of two superior free-machining grades—Bessemer *and* Open Hearth—so that you can select the screw stock that will give you the *best* properties for any specific application.

USS MX Free-Machining Steel is produced in all the popular screw stock sizes. It is sold in cold finished form by your regular supplier, either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our nearest district sales office.

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—Consult your newspaper for time and station.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

5-207

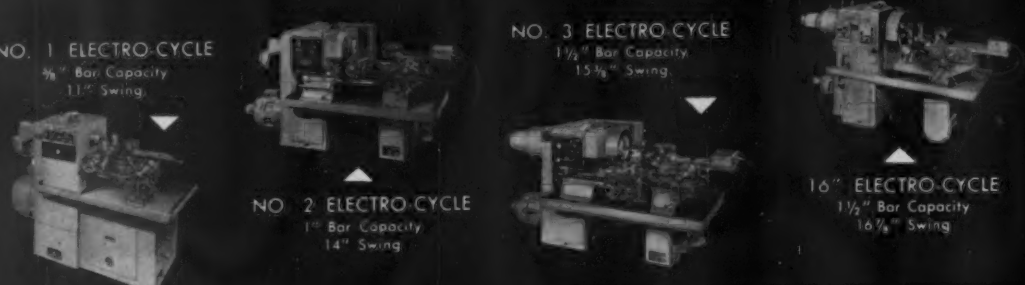
UNITED STATES STEEL

RAM TYPE TURRET LATHES

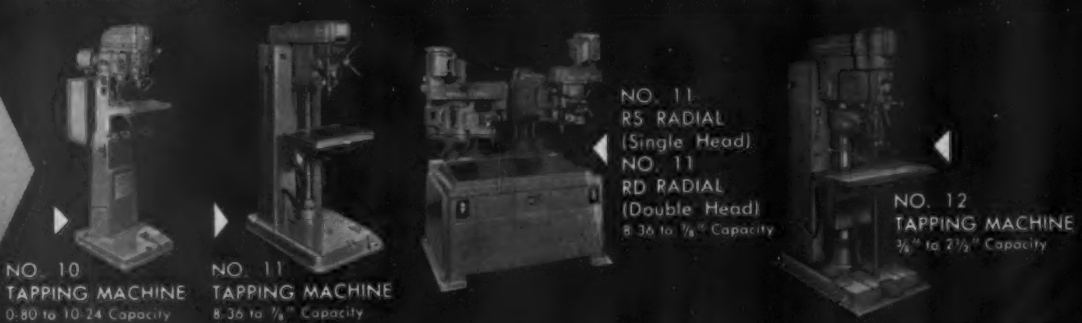
SADDLE TYPE TURRET LATHES
HEAVY DUTY

SADDLE TYPE TURRET LATHES
EXTRA HEAVY DUTY

ELECTRO-CYCLES®



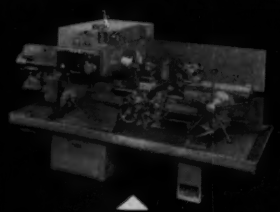
PRECISION TAPPING AND THREADING MACHINES



No. 4 (M-2240) AND No. 5 (M-2250) RAM TYPE TURRET LATHES

ALL-CLUTCH AUTOMATIC SHIFTING HEAD

NO. 4 (M-2240)
2" Bar Capacity
18⅛" Swing



NO. 5 (M-2250)
2½" Bar Capacity
20" Swing

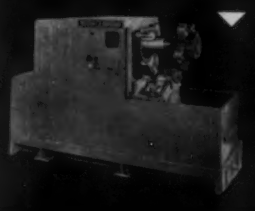
THERE is a proper size and type Warner & Swasey machine to fill your turning needs, for it has always been a cornerstone of Warner & Swasey policy to build an individual model for each type of work.

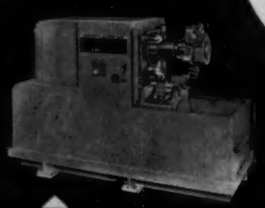
YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

75TH ANNIVERSARY YEAR
WARNER & SWASEY
Cleveland
PRECISION MACHINERY
1880 — 1955

SINGLE SPINDLE AUTOMATICS

1 AC CHUCKING MACHINE
8" or 10" Chuck —
6" Working Stroke

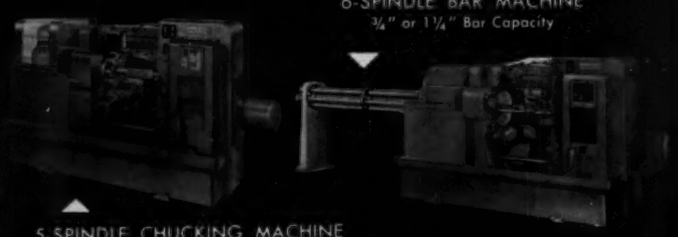




2 AC CHUCKING MACHINE
10" or 12" Chuck —
9" Working Stroke

MULTI-SPINDLE AUTOMATICS

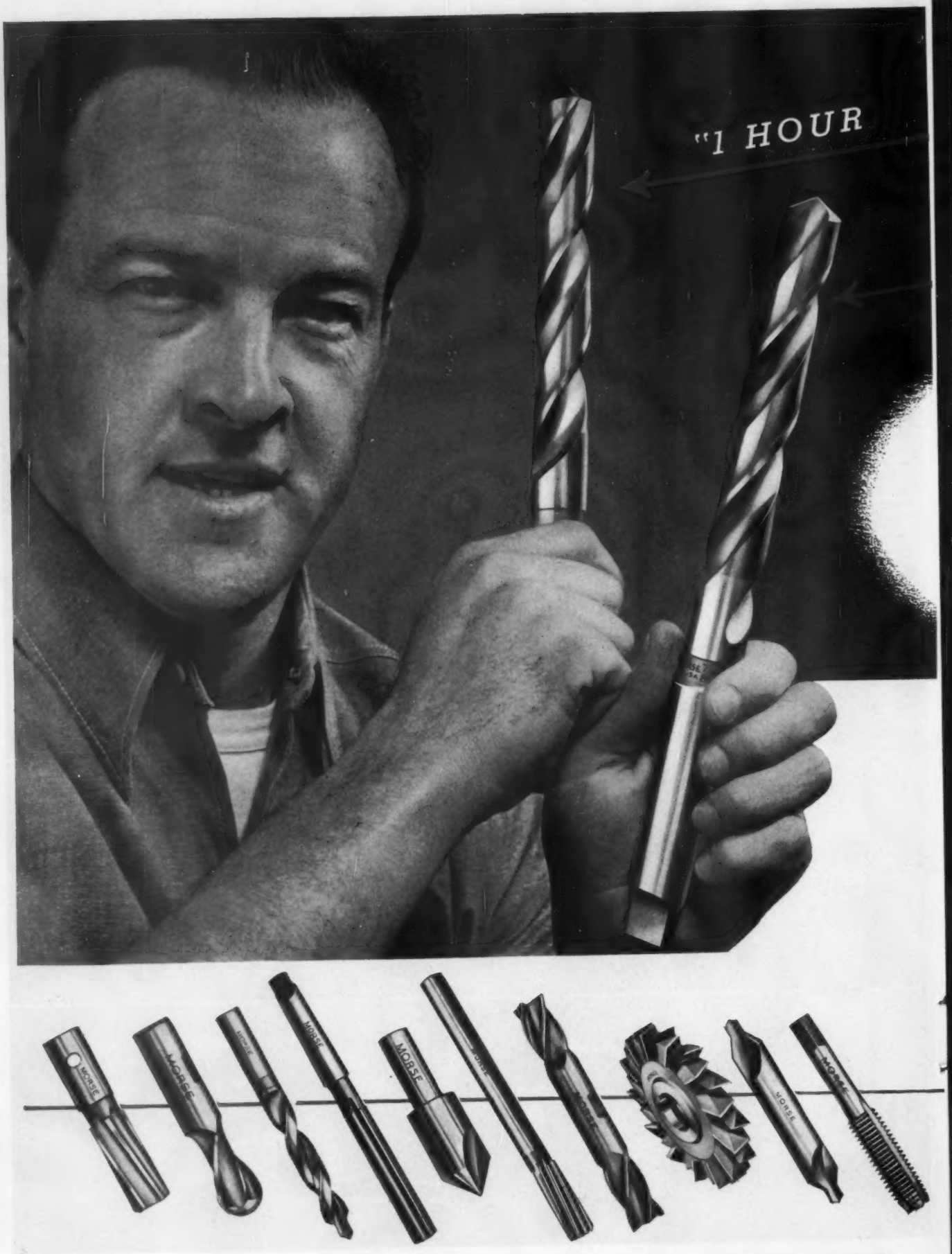
5-SPINDLE BAR MACHINE
1¾" Standard Bar Capacity
2¼" Oversize Capacity



5-SPINDLE CHUCKING MACHINE
6" Swing

6-SPINDLE BAR MACHINE
¾" or 1¼" Bar Capacity

®Reg. U. S. Pat. Off.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MORSE

WITH THIS DRILL . . .

5 HOURS WITH THIS DRILL!"

. . . this extra tool-life is typical of

MORSE

Electrolized Tools!

Yes, our files are full of documented testimonials that Morse *Electrolized* Cutting Tools have lasted anywhere from 2 to 10 times longer than untreated tools . . . proof from scores of users that Morse *Electrolizing* lengthens the life and steps up the performance of cutting tools that are subject to excessive wear, abrasion and corrosion.

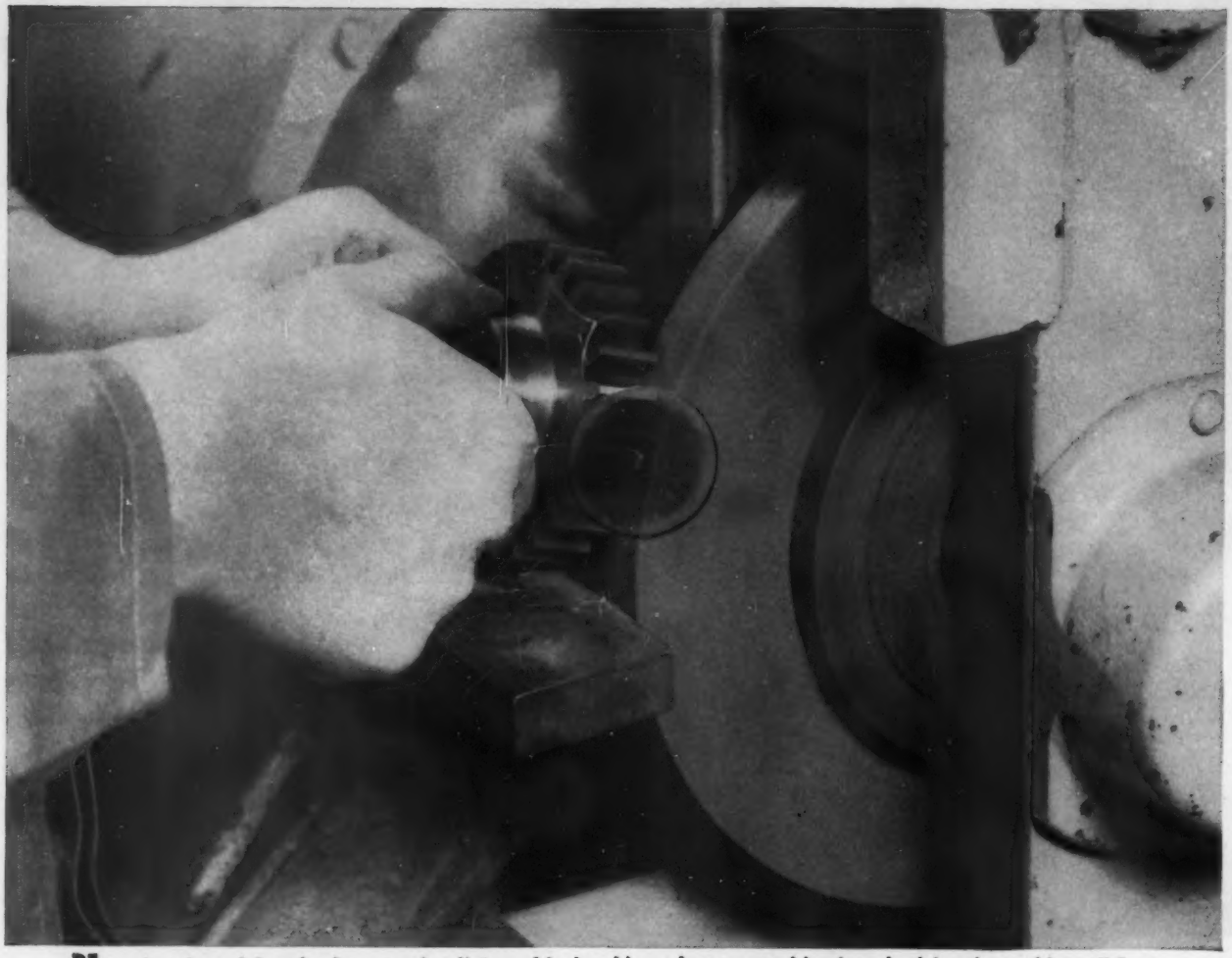
Briefly, here's what Morse *Electrolizing* does: Relieves internal stresses, raises fatigue limit, increases tool life . . . fortifies tool by a uniform surface of hard, dense alloy . . . provides exceptional anti-galling characteristics . . . gives greatest corrosion-resistance with fine-grained surface . . . permits no distortion.

Now, in the application of Morse *Electrolized* Tools to your own particular needs, consult your Morse-Franchised Distributor. He commands the close cooperation of Morse engineers on any tough job you have now . . . or on any job, *tough or not*, where you can profit by the extras you get *only* in Morse *Electrolized* Tools.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

MORSE
Cutting Tools

buy them by phone from your Morse-Franchised Distributor and save ordering time



BF — A universal favorite for removing light welds, breaking edges on machined work, deburring, taking off flash from plastic parts and many other light portable and bench grinding operations. To be used on periphery only.

The jobs they do!...The money they save!

Norton Reinforced Wheels add the "TOUCH of GOLD" that cuts time and costs on countless everyday grinding jobs

You get *more* than 100 cents' worth of usefulness for every dollar you spend on Norton Reinforced Wheels.

You get extra-long service life, exceptional strength and fast, cool, trouble-free grinding — the Norton-engineered "Touch of Gold" that saves you money in the widest range of routine grinding jobs, from light deburring to heavy cutting-off.

To this top grinding performance Norton Reinforced Wheels add a wide margin of safety. All four are resinoid bonded and reinforced by layers of tough fabric molded into them. As follows:

BF — *Semi-flexible straight wheel, cotton fabric reinforcement. Also available in mounted wheels and points and hand sticks.*

BN — *Straight wheel with glass cloth reinforcement. Primarily a cut-off wheel, its rough knurled sides provide additional cutting action.*

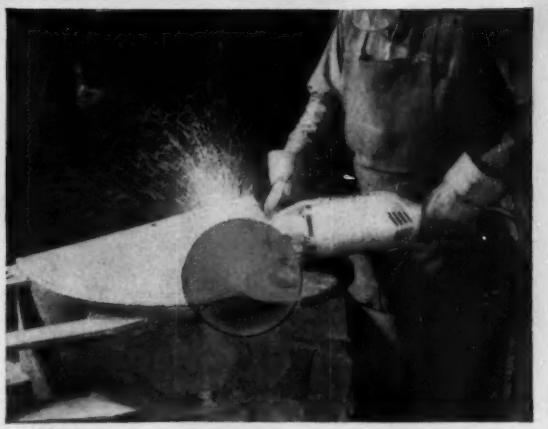
BD — *Rigid hub-type. Glass cloth and Nylon reinforcement. Designed especially for right angle portables and disc sanders.*

BFR — *Semi-flexible hub-type. Cotton fabric and Nylon reinforcement.*

See Your Norton Distributor

for a demonstration of Norton Reinforced Wheels in your shop, on the jobs you're doing every day. Ask him for the new, 34-page illustrated catalog on Reinforced Wheels. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

BN — The preferred cut-off wheel for non-ferrous and non-metallic jobs. Also excellent for cutting wire rope, slotting rails, tuck pointing etc. Used on swing-frame and stationary cutting-off machines, large and small portables.



BD — A specialist in heavier stock removal, such as welds on fabricated work, smoothing flame-cut edges, cleaning between teeth of gear castings, etc. — also for slotting, notching and cutting-off.

BF — Mounted Wheels and Points have the same strong laminated construction as the larger BF wheels. For polishing die cavities, chamfering, Brinell spotting, etc. For hand finishing, use BF sticks.

BFR — Excels at the lighter portable jobs, such as rust and scale removal, light weld grinding, scarfing and beveling, blending contours, notching gates and risers.

W-1636

NORTON

Making better products... to make your products better

and its BEHR-MANNING division

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

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BALANCED Action TAPS

Any style or size tap you need—standard or special—will be a Balanced Action tap when you specify "WINTER."

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Plug and Ring, Threaded and Plain, with accuracy and long-wear built in by Balanced Action manufacturing methods.

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National

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It's the Cutting Edges that Count!

It pays to use precisely designed and carefully made cutting tools: *Nationals:* Their cutting edges, famed for long life, give you smooth, trouble-free operation.

End Mills and other National tools are now available with **Carbide Tips**

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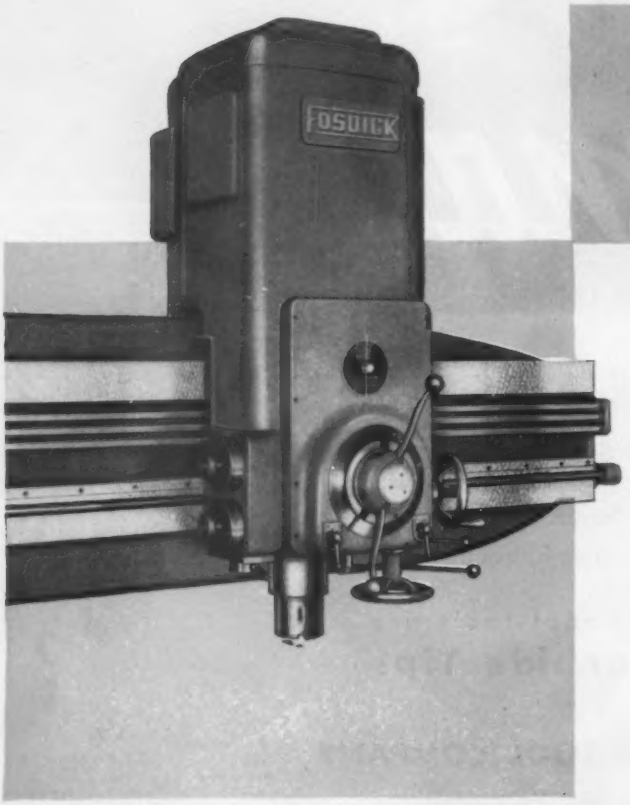
With the NEW FOSMATIC Radial Drill

Pre-select Feeds and Speeds

All the new features needed by the modern machine shop have been designed into the new Fosmatic Radial Drill. Pre-selected feeds and speeds for a new degree of speed and operator convenience. Spindle speeds up to 3000 rpm to suit today's high-production requirements. Engineering refinements throughout to give you the rigidity you need for fast precision drilling.

Feeds and speeds are selected on dials at left side of the head, usually while waiting for a drilling operation to be completed. Shifting is accomplished by raising the spindle control lever slightly in its neutral position. Feed is engaged by pressing a button on either of the quick-return handles; feed is disengaged either by depth control or pressing one of the buttons. Other convenient controls at the head – Single lever elevates arm or traverses head (hydraulic variable rapid traverse). Hydraulic column clamp. Hydraulic arm clamp, safety-interlocked with elevating lever. Hand feed and traverse to the head. The tool ejector eliminates need for tang driver.

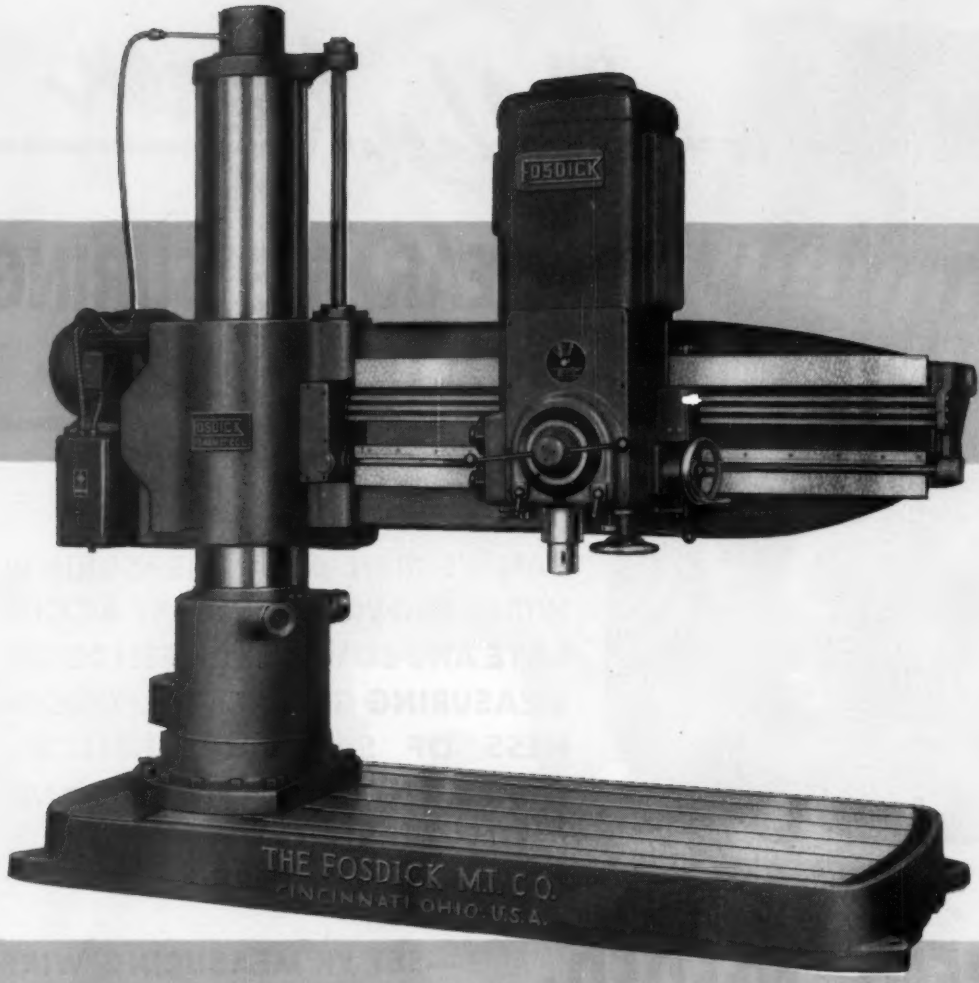


• • • • Drill with

Smooth running, high precision and extra rigidity make the new Fosmatic outstanding among Radial Drills. Case-hardened gears are ground on the finest equipment available. They run on ground splined shafts which are mounted in ball bearings. Lubrication is automatic.

Thirty-six spindle speeds with a maximum of 3000 rpm are available in a variety of ranges, each with a 127.5 to 1 ratio. The new boring-type spindle is of heavy section with bearings placed far apart for extreme rigidity; it can easily be used for boring, milling and the heaviest drilling. A new and unique counterbalance produces equal tension on the spindle whether it is extended or close to the head.

NEED DRILLING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!



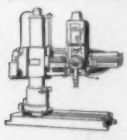
Speed, Ease and Precision

For more efficient tapping, reverse spindle speed is 40% faster than forward speed.

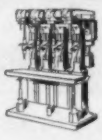
Our new arm is probably the strongest in the business. It has a double boxed section with very heavy walls; ways have been widened considerably. The head is mounted on roller bearings on hardened and ground ways with an additional roller support in back of the arm. Safety nut is hydraulic. Column is superfinished.

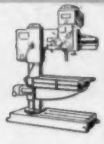
Eighteen feeds are available, including 5 tap leads, from .003" to .125". Feed engagement is through a powerful magnetic clutch which will never require adjustment. The feed dial is graduated to full spindle travel to eliminate resetting for deep holes. Electronic milling feeds are also offered — from ¾ to 15 ipm.

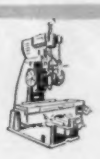
Standard sizes available with 4' to 8' arms, 13" to 19" columns.


Radial Drills

Jig Borers


Sensitive and Upright Drills


Sensitive Radial Drills


Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

THE Van Keuren GEAR MEASURING SYSTEM

Set 26EX—Gear Measuring Wires, accurate to ± .000025", for common diametral pitch external spur gears.

VAN KEUREN GEAR MEASURING WIRES PROVIDE THE MOST ACCURATE AND LOW COST METHOD OF MEASURING THE TOOTH THICKNESS OF SPUR AND HELICAL GEARS, INVOLUTE SPLINES AND INVOLUTE SERRATIONS.

ONLY... EQUIPMENT NEEDED:

1—SET VK MEASURING WIRES
1—MEASURING INSTRUMENT

Complete information regarding the use of Gear Measuring Wires is contained in a 50-page section of the Van Keuren CATALOG and HANDBOOK No. 36. Included in this section are:

- **. . . table of wire sizes for the 1.92", 1.728", 1.68" and 1.44" series.**
- **. . . tables of wire measurement including change factors for standard external and internal spur gears of 14½°, 17½°, 20°, 25°, and 30° pressure angles and of from 5 to 500 teeth.**
- **. . . table of relationships between depth of cut and tooth thickness for common pressure angle gears.**
- **. . . definitions and exact formulas covering involute spur gears.**
- **. . . tables of involute tooth parts for standard addendum and stub tooth involute gears.**
- **. . . information, formulas and examples regarding the wire measurement of helical gears.**
- **. . . information and examples concerning the wire measurement of enlarged pinions and reduced gears.**
- **. . . tables of wire measurement for involute splines.**
- **. . . tables of wire measurement for involute serrations.**
- **. . . tables of comparative measurement over three sizes of wires for use in involute profile checking.**

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

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36th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Laps and Surface Plates . . . Precision Lapping Service.

CINCINNATI

1205 REVIEW

. . . highlighting **CINCINNATI MILLING'S**

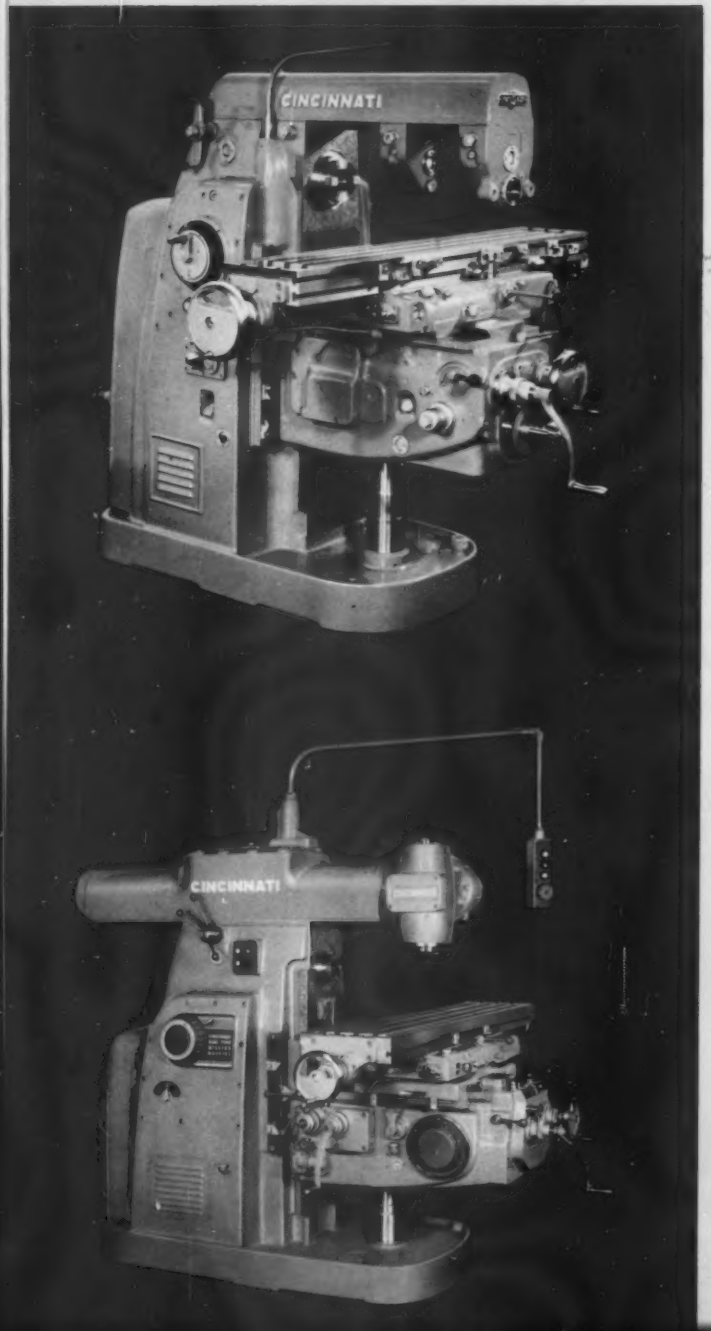
exhibit at the

Machine Tool Show

THE CINCINNATI MILLING MACHINE CO. CINCINNATI 9, OHIO

CINCINNATI

According to the publisher of a widely distributed metalworking magazine, over 45% of their readers did not plan to attend the recent Machine Tool Show. Were you one of the "stay-on-the-job" group? If you were, we're sure that you're just as interested in what's new as those who attended the Show. And we want you to see some of the fine machine tools that were operating and demonstrated in Cincinnati Milling's display Area 1205. Open this advertisement its full length . . . there you see today's finest milling machines and complementary equipment. Then turn the page over its full length and you will see the newest in precision grinding machines, designed to improve quality and reduce costs. And be sure to take advantage of the literature offer mentioned in the closing statement, rear of this advertisement.

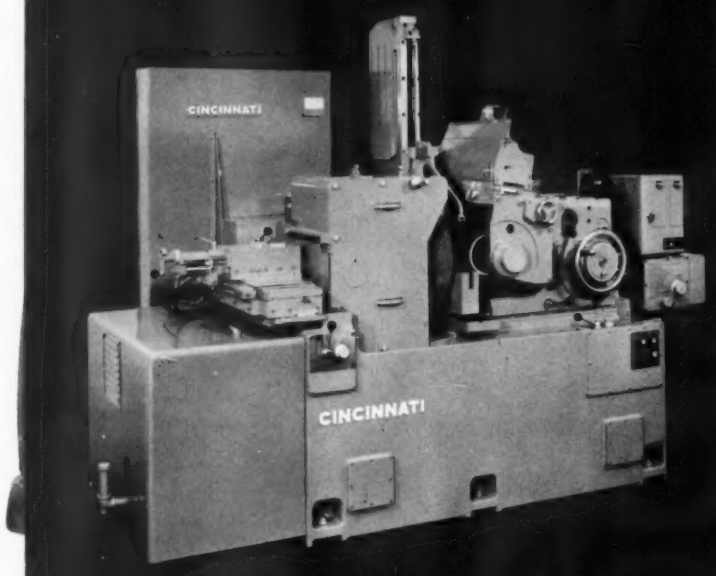


New CINCINNATI Nos. 2ML and 2MI Milling Machines

New features which will reduce costs in your shop include auxiliary motor for feed drive (full hp of main drive motor transmitted to the spindle); cutting fluid pump now individually motor driven; filters relocated for easier accessibility. Automatic Table Cycles, available for Plain and Vertical Machines, include Automatic Backlash Eliminator. Automatic Spindle Stop available for Automatic Cycle Machines. The illustration shows a No. 2MI Plain, with Automatic Table Cycles. Publication No. M-1916.

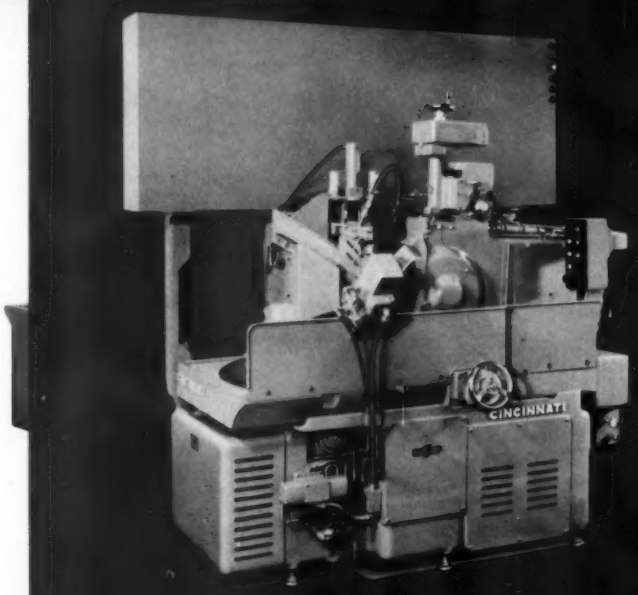
New CINCINNATI Dial Type Milling Machines

are heavier and more powerful than ever before, yet they retain the famous Dial Type characteristics of accurate performance and convenient, easy operation. All sizes (Nos. 2, 3, 4) are available in Plain, Universal and Vertical styles. All are equipped with Automatic Backlash Eliminator; motor driven cutting fluid pump; feed drive motor mounted on the knee; push-button spindle speed change and spindle start-stop. New Independent Overhead Spindle Attachment (illustrated) available for Plain and Universal Machines. Plain and Vertical Machines are available with or without Automatic Table Feed Cycles. Catalog No. M-1915.



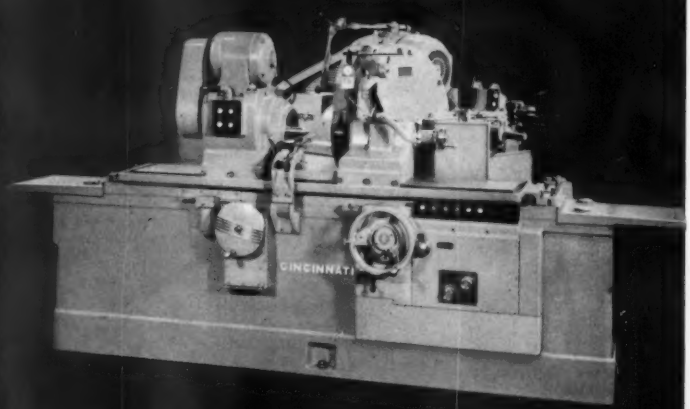
New CINCINNATI FILMATIC No. 3 Centerless Grinding Machines

are completely new from the floor up. Cost-reducing features include anti-friction lower slide; infinitely variable regulating wheel drive; power profile grinding wheel truing; stabilized infeed screw. Extra equipment includes automatic grinding wheel balancing and bar grinding attachments for work up to 24 feet long. Many other attachments are available, including Automatic Infeed, Feedmatic Hoppers, various types of Workrests, etc. Write for catalog No. G-664.



New CINCINNATI FILMATIC Micro-Centric Grinding Machines

like their predecessors, perform the miracle of combining high production with working gage accuracy. New Micro-Centric features include magnetic drive plate which greatly reduces loading time; front handwheel control with fine and coarse adjustment positions; machine mounted cabinet for complete and accessible electrical controls. Ask for catalog No. G-662.

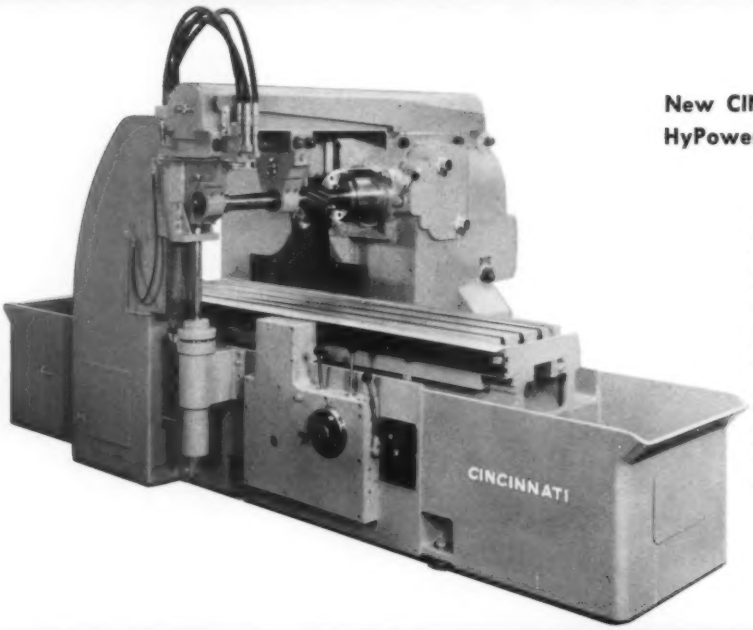


New CINCINNATI FILMATIC Semi-Automatic Angular Wheel Slide Grinding Machines

drastically reduce the cost of precision cylindrical work requiring accurately ground diameters and adjacent shoulders. Both are completed in one automatic infeed cycle. These machines, built in 6"R, 10"L, 10"R and 14"L swing sizes, are equipped with Automatic Grinding Wheel Balancing. Get your copy of catalog No. G-647.

New CINCINATI High Power and Dual Power Dial Type Milling Machines

are unquestionably the heavyweight champions among knee-type milling machines. Now, the full power of the main drive motor (up to 50 hp) is transmitted to the spindle; a 5 hp motor takes care of feed and rapid traverse requirements. One lever selects 24 spindle speeds and 32 feeds; one lever engages table feed and rapid traverse; a small lever on the knee engages the spindle clutch. The power and agility of this heavyweight champion is truly controlled with your fingertips. Built in Nos. 3, 4, 5 and 6 sizes. More information in catalog No. M-1917.



New CINCINNATI Tracer Controlled HyPowermatic Milling Machines

are built in Plain and Duplex styles and 42 sizes of each from 36" to 168" table traverse; up to 50 hp spindle drive and separate 5 hp feed drive. They combine heavy duty tracer controlled milling with all the conventional milling operations assignable to Plain and Duplex HyPowermatics. Simple sheet metal template are attached to the fixture or table. Profiles having curvatures and straight lines at angles up to 80° from the horizontal can be accurately milled. Want complete specs? Ask for catalog No. M-1909.

New CINCINNATI FILMATIC No. 2 Cutter and Tool Grinder

Good News — FILMATIC has been added to the name of another Cincinnati machine tool . . . CINCINNATI FILMATIC No. 2 Cutter and Tool Grinder. These famous machines are now equipped with a lifetime spindle unit incorporating FILMATIC bearings. You'll like these features, too . . . the main drive motor is more powerful (1 hp) and built into the wheelhead; the slenderized column requires less floor space; ways for anti-friction slide are hardened and ground. Complete data in catalog No. M-1914.

THE CINCINNATI MILLING MACHINE C

New CINCINNATI Contourmaster Tool and Die Milling Machines

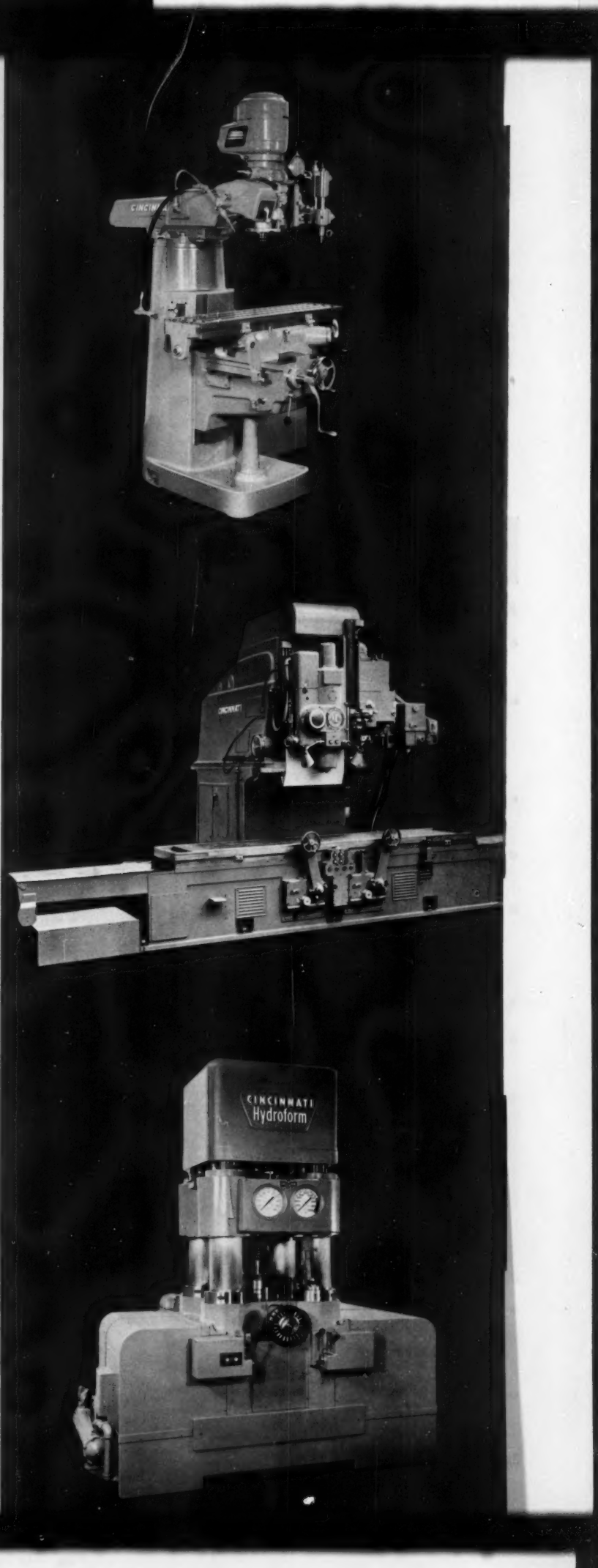
have all the features and characteristics so desirable for low-cost die sinking operations. The table is manually controlled. For die sinking, vertical movements of the cutter head are automatically controlled through the Automatic Hydraulic Depth Unit and manually controlled for boring and drilling through slow feed handwheel or rapid action lever. Table traverse, 16" or 22"; cross traverse, 10"; spindle drive, 1 hp Catalog No. M-1919.

New CINCINNATI 30" Vertical Hydro-Tel Milling Machine,

a new member of the Hydro-Tel line, is flexible and easy to manipulate. It was developed for shops requiring large, rangy vertical millers having 20 hp spindle drive. Can be equipped for die sinking and/or profile milling. Operating controls are located at the front of the machine. Available in three bed lengths to provide table travel of 60", 96" or 120". More information available.

New CINCINNATI 12" Hydroform Machines

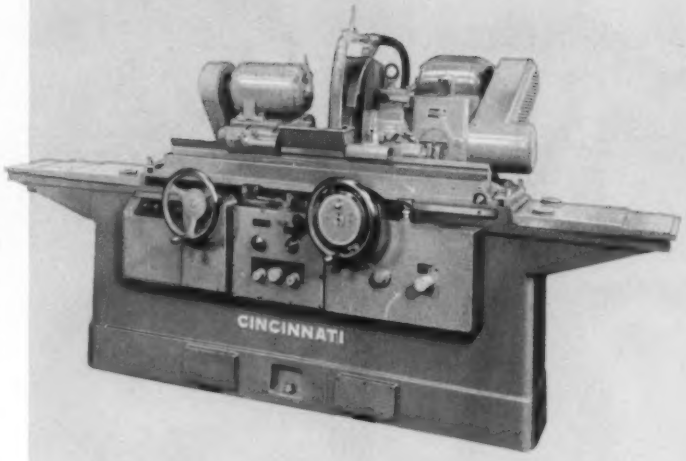
are greatly improved in appearance; they're more compact and require less floor space. Operating mechanisms within the machine have been redesigned to reduce maintenance expense. These machines and others of the five sizes available, are making enviable records in improving quality and reducing the cost of intricately formed parts. More details in catalog No. M-1908.



CINCINNATI 9, OHIO

New CINCINNATI FILMATIC Plain Hydraulic Grinding Machines

are more convenient to operate and more accurate in performance than ever before. In addition, Automatic Grinding Wheel Balancing, a feature that will pay off handsomely in your shop, is included with standard equipment. The following types of production equipment are available: Push-button Automatic Infeed Attachment; Automatic Gap Eliminator; Behind-the-wheel Profile Truing; Automatic Electric Gage Sizing with Automatic Compensation. Get the complete story in the following catalogs . . . 6"R and 10"L machines, G-660; 10"R and 14"L machines, G-661.



New CINCINNATI FILMATIC 12", 14" and 18" Hydraulic Universal Grinding Machines

New features of productivity and accuracy are incorporated in the new CINCINNATI FILMATIC 12", 14" and 18" Hydraulic Universal Grinding Machines. Pick feed rates are infinitely variable, and may be engaged at the right, left, or both ends of the stroke; the footstock spindle is now chromium plated to prevent wear; headstock speeds are selected with an easy-to-turn dial; rapid cross traverse feature available. Want more information? Ask for catalog No. G-663.

FILMATIC

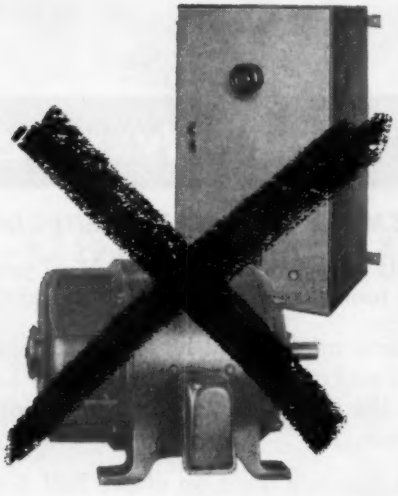
CINCINNATI

It was a great show . . . the greatest ever. And Cincinnati Milling did their level best to demonstrate new machines and methods that constitute the world's best investment for shops of all sizes. We would much prefer to have talked to you personally, and to have given you more information and ideas that would be of more direct benefit. But for those who could not attend the Show, we'll have to settle for this brief review of 13 of the 43 machines in Cincinnati Milling's display Area 1205. We will be glad to forward literature on any of the equipment illustrated in this advertisement. Just give us the catalog numbers of the machines in which you are interested.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI

No need for Special Motors, Control with *Vari-Pitch* Sheaves



***Vari-Pitch* sheaves are the low cost way of providing accurate stepless speed control. There's a type and size for every need.**

Two Basic Types

1. Stationary control type can be used for infrequent speed changes when sheave is at rest.

2. Motion control type is available for applications requiring repeated speed changes while drive is in motion.

Both types are available in standard range sheaves to provide speed variations to 196%, and in wide range type sheaves to provide variations to 400%.

For complete information call your nearby A-C office or distributor — or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin. A-4843

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

- ASSURES ACCURATE MEASUREMENT AT LOW COST
- REDUCES GAGE INVENTORY
- SOLVES DIFFICULT INSPECTION PROBLEMS
- LOWERS PERISHABLE TOOL COSTS
- HOLDS DOWNTIME OF PRODUCTION EQUIPMENT TO A MINIMUM
- ASSURES QUALITY IN QUALITY CONTROL

all these advantages and more are combined in

EXTREMELY ACCURATE PERFORMANCE

- Wholly integrated design, built to precise machine tool standards for extreme rigidity.
- Precision mirrors and lenses are specifically designed and manufactured by Jones & Lamson to meet the exacting qualifications of optical inspection.
- Work tables guided on either ball bearings or scraped ways.
- Angle measurements read direct to the exact minute.
- Projection illumination approaching the ideal point source of light affords sharp, high contrast shadow images on the viewing screen.

VERSATILITY

- Long focal length lenses provide generous clearance in the staging area at all magnifications.
- Multiple lens mount allows rapid selection of any of six preset magnifications. You just turn a knob. Single lens mounts accept lenses of all magnifications without adjustment.
- ***5″ or 8″ capacity in one machine. Simply lower or raise work table assembly.

...AND MORE VERSATILITY

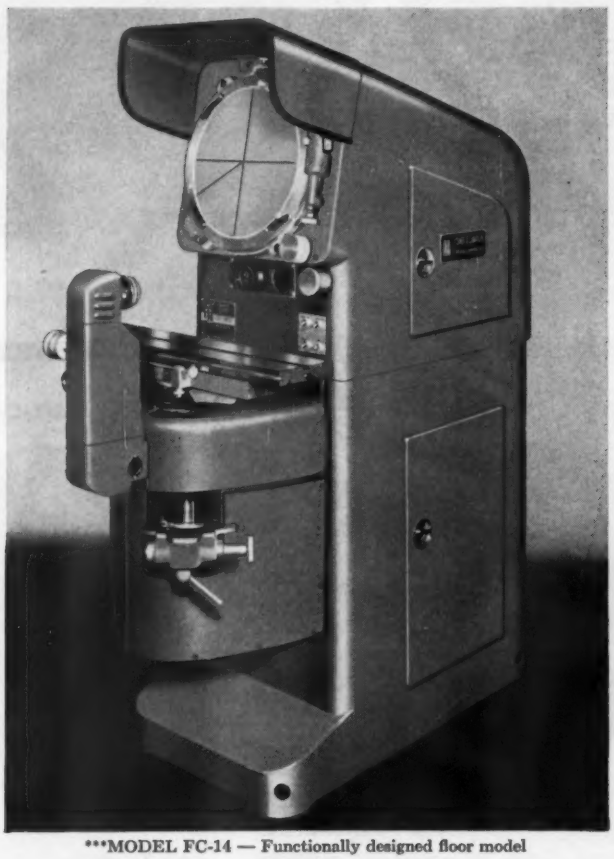
- Reflection attachment provides an acute angle light source at each side of the projection lens for oblique illumination. The light can be converged from a 1½″ to a ¼″ area. This is extremely beneficial for reflections at high magnifications.
- Normal light reflection attachment allows reflection inspection of deep holes, shoulders and polished surfaces.
- Vertical projection can be obtained with vertical illuminating attachment, providing a light source at right angles to the projection lens. Vertical projection tables allow parts to be staged on a clear glass surface with coordinate travel of 3″ x 4″. Measurements to .0001″.
- Tracing attachments, for inspecting surfaces that cannot be projected or reflected, consist of a coordinate slide that gives corresponding paths to two carbide tipped stylii.
- Photographic records may be taken directly on the viewing screen.

EASE OF OPERATION

- ***Electronic variable speed vertical measuring control allows work piece to be raised or lowered, slowly or rapidly. Quick, precise measurements to .0001″ are made in this same motion with fingertip control.
- Erect image at all magnifications.
- 10° screen angle allows comfortable viewing at a natural position for one or *several* people. This screen angle makes the use of overlay charts extremely easy.
- Screen location in relation to work area permits coordination of hand and eye for most efficient operation.
- **Cabinet base for table models, designed for convenient height of seated operator, contains storage space for charts and fixtures. A dolly for this base makes this unit a portable comparator.

JONES & LAMSON **NEW**

14" SCREEN OPTICAL COMPARATORS



***MODEL FC-14 — Functionally designed floor model

**MODEL TC-14 — All purpose table model

JONES & LAMSON

World's Largest Manufacturer of Optical Comparators since 1919

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 101, Springfield, Vt., U.S.A. OPTICAL COMPARATOR DIV.

B7 NEW BOND TYPE

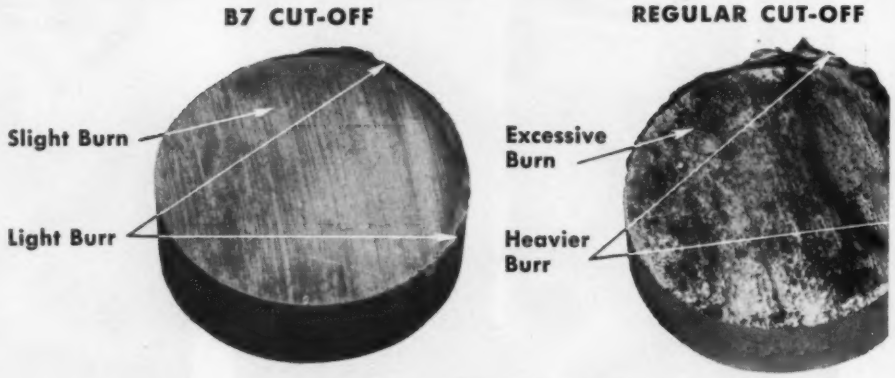
★ **LONGER WHEEL LIFE**

with equal quality of finish

B7 BOND WHEEL

★ **BETTER QUALITY OF FINISH**

with equal wheel life



COLD ROLLED BAR STOCK, 1⅛" DIAMETER

...continually puts more SENSE in your abrasive DOLLAR

SETS NEW STANDARDS OF PERFORMANCE

FOR ABRASIVE CUT-OFF

WHAT ARE YOU LOOKING FOR in your cutting-off operations... freedom from burn and burr?... close tolerance accuracy?... high production?

Here's a revolutionary new bond type—B7—which is the finest combination yet developed to give you maximum work finish, maximum cut-off speed, and maximum wheel life.

Thousands of these new wheels have been job-proven on work just like yours. The B7 Bond Cut-Off Wheel is *another* CARBORUNDUM development. It's a wheel you'll use with profit!

PLUS NEW FEATURES

NEW distinctive wheel marking —for instant recognition

NEW simplified gradings —R, T, V grades only

NEW rough sides are standard— no need to specify RS on order

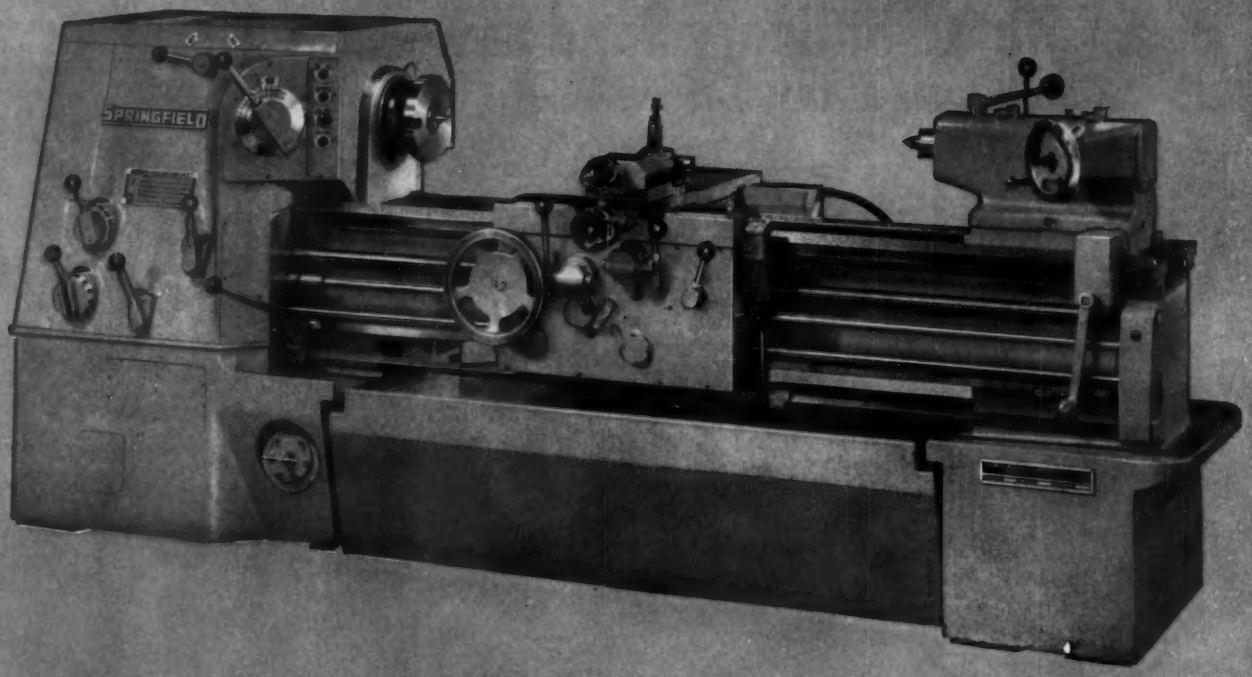
TRY ONE YOURSELF!

A simple demonstration in your shop, on any material you're cutting, will convince you that B7 Bond Resinoid Cut-Off Wheels will outperform any other wheels you can use. Call your Carborundum Distributor or salesman to arrange a time most convenient to you. He's listed in the yellow pages of your phone book under "Abrasives" or "Grinding Wheels."

CARBORUNDUM

REGISTERED TRADE MARK

SPRINGFIELD
CUB



more useful horsepower

All the horsepower in a Springfield Model "S" Lathe is productive.
A simple, straight-forward gear train, plus double-action lubrication, plus tight dynamic balance tolerances (.0005" displacement) eliminate friction and vibration, the twin horsepower thieves.
In the headstock, only the gears necessary to a given speed are engaged. Other gears run free with a stabilizing flywheel action, no drag on power.
A high pressure filtered oil mist keeps all gears and bearings drenched, and a cascade of oil lubricates the feed box.

Lathes: Engine and tool room, contouring and reproducing—swings 14" to 32".
Vertical Universal Grinders: swings 18" to 42".

The Springfield Machine Tool Company
Springfield, Ohio
60TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

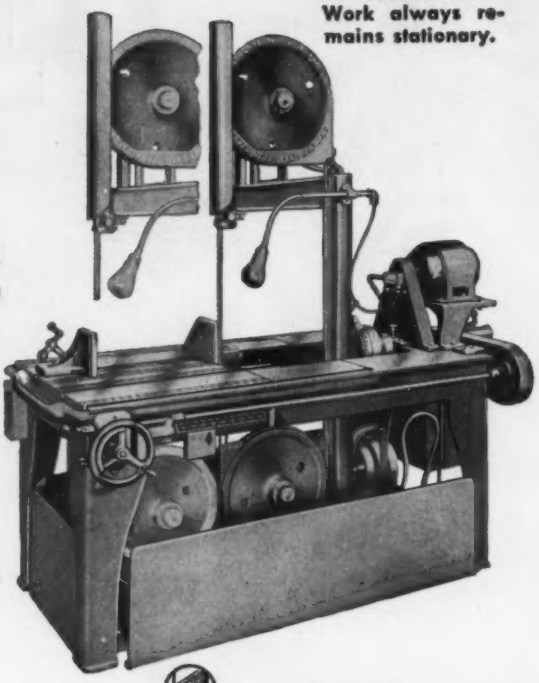
SPRINGFIELD

Never Confuse the No. 8 MARVEL with an ordinary Band Saw

...only the MARVEL is Universal

Only on a MARVEL No. 8 does the blade remain at a right angle throughout its full 18" feed traverse. Work always remains stationary.

Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle — without moving the work.



Only a No. 8 MARVEL can do all of these things: Snip-off a ⅛" rod or cut-off an 18" x 18" cross section

Rough to Size and Shape

Miter

Index

cut off and shape Structural Beams

Only a No. 8 MARVEL has the large T-slotted work table, with removable quick action vise, that permits accurate set-ups of work of unrestricted sizes and shapes, special fixtures; Etc.

"Rough Machine" to size and shape with minimun chip waste

The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a *universal* tool—has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACHINE TOOL" electrical standards; Dirt-proof ball bearings, etc.

If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

MARVEL Metal Cutting SAWS

Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

NEW

100%

HYDRAULIC

preselection

of 36 SPEEDS

and 18 FEEDS

plus ....SIMPLE PRESCHEDULING

Pre-selection of all speeds and feeds is a new development in radial drill design that saves time and effort. At any time, merely turn 2 convenient direct-reading dials to the proper speed and feed for the next operation. Gears shift hydraulically—quietly and quickly.

Pre-scheduling of radial drill operations is conveniently and simply done without expensive, complicated programming attachments on Super Service Radials. These features will cut drilling costs.

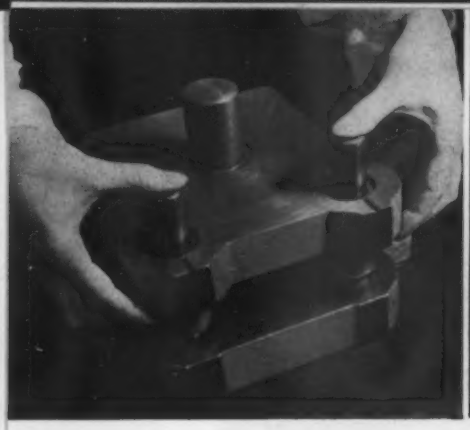
◀ Get all the facts by writing for Booklet R-33.

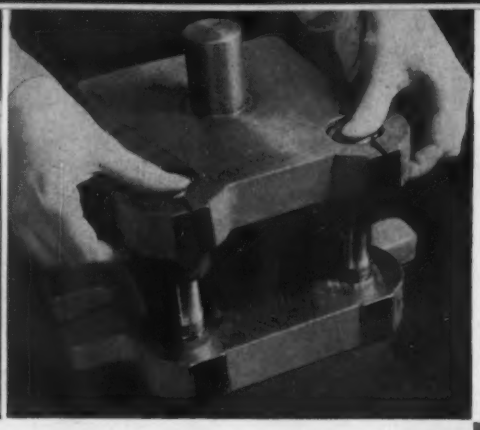
CINCINNATI
BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.





Here's a real test for quality...if you can make the punch holder glide up the pins just by squeezing—and hold its position without sinking back—it shows that the fit between pins and bushings is well-nigh perfect. The "finger-tip" action is typical of all DIECO die sets small enough to squeeze this way...and the larger ones are just as perfectly fitted.

What does "quality" in a die set mean to you?

If it means a perfect fit between pins and bushings...shoes that are absolutely parallel and stay parallel under load...*all* parts finished to precise tolerances with such unfailing regularity that there is never any variation in accuracy and serviceability among different die sets from the same source...then it stands to reason you must already be a user of DIECO die sets.

- Hardened steel pins superfinished and individually gaged to 0.002" tolerance.
- High-tensile steel shoes, stress relieved and precision machined.
- Choice of bronze-plated bushings on hardened steel backing or hardened steel bushings—all with grease fittings. Precision ground and micro-honed to less than a "tenth" tolerance; can be arranged for pressure lubrication.
- Welded or screw shanks; any length guide pin.
- 1728 combinations in steel or semi-steel; interchangeable parts speed delivery.

E. W. BLISS COMPANY

BLISS
SINCE 1857

DIE SUPPLY DIVISION

DIECO

1400 Brookpark Road,
Cleveland, Ohio

Industry's most complete line of die sets and die makers supplies

DIE SETS • GUIDE PINS • BUSHINGS • SPRINGS
SOCKET HEAD SCREWS • 5001 ITEMS

DIE SUPPLY PLANTS AND OFFICES

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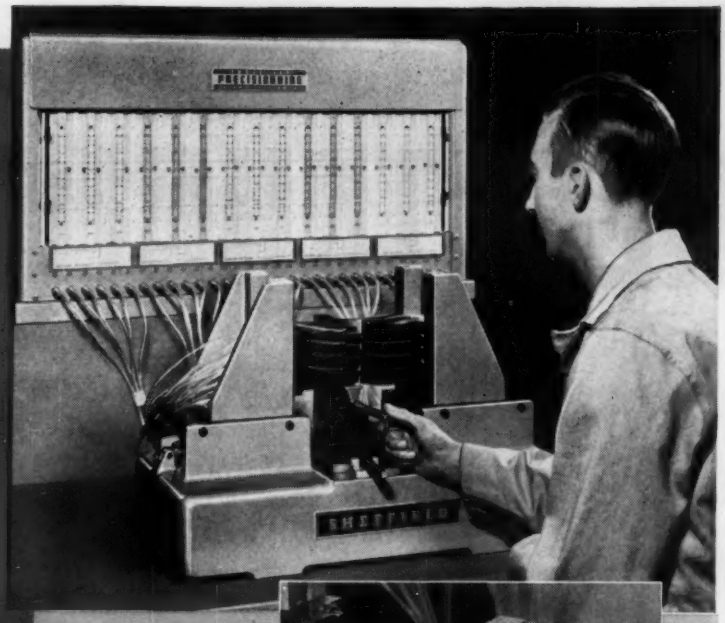
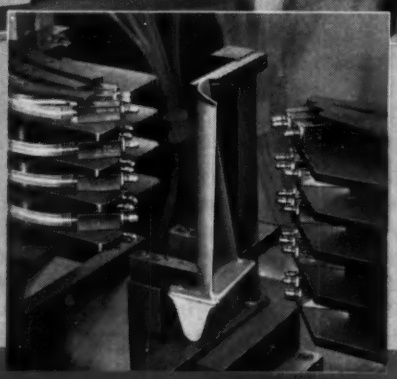
YOU CAN GAGE 40 or MORE DIMENSIONS *As Quickly* AS YOU CAN ONE



Checking 30 points on a jet engine blade



Gaging heads ready to approach the jet engine blade

Spectacular developments in AIR gaging are saving industry millions of dollars and thousands of man-hours. Here's how and why:

1. One operator with one gage can check up to 40 or more dimensions of each work part simultaneously and instantly. The number of parts per hour depends solely on how fast the inspector can handle them.

2. Precision is built into the gage—readings are unaffected by human skill, human judgment and human memory. It's not necessary to memorize and compare readings for individual dimensions—one quick panoramic glance at the float pattern ("Airechart") tells the whole story—the "Float Graph" shows the true condition of every critical dimension.

3. The position of each float shows just where the dimension is within tolerance limits or just how much above or below limit if it is out of tolerance. This is essential for Quality Control.

PHONE, WIRE or WRITE for the full story on how YOU can "produce more and better products at lower cost through practical precision"—in this case, multiple dimension inspection by Precisionaire gaging.

Gage Division — The Sheffield Corporation
Dayton 1, Ohio, U.S.A.

All main bearings of a tractor crankshaft are checked simultaneously

6757

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

ELECTRUNITE SAVING 9¢ PER INCH

Clamp-type air and hydraulic cylinders made by Carter Controls, Lansing, Illinois, make many manufacturing operations automatic. Typical might be toggle operations, spring motion returns, die-set strippers, multiple holding and clamping.

One model of this low-cost, all-purpose cylinder delivers a two-inch stroke through a 2.4-inch steel air-cylinder body. For these bodies, Carter Controls had been using tubing made by a different method. A switch to Republic ELECTRUNITE® Electric Resistance Welded Tubing eliminated expensive ball sizing and burnishing for one thing. Since the ball sizing could only be done in short lengths, it was necessary to cut the tube prior to balling.

Now, Republic ELECTRUNITE Mechanical Tubing is purchased in long lengths and automatic screw machine production is practical.

The result of all this is that the air-cylinder body made of Republic ELECTRUNITE Steel Tubing shows a gross manufacturing saving of more than nine cents an inch!

Republic ELECTRUNITE Mechanical Tubing is consistently uniform in wall thickness, tolerances, roundness and surface finish. It is *precision* tubing on a production basis in every sense of the word, available in both carbon steel and in stainless steel analyses.

Write Republic your problem in any tubular or cylindrical part. Let's see where we can help you save . . . pennies or dollars.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
3102 East 45th Street
Cleveland 27, Ohio

Saving money interests me.
Send facts showing how your products can help.

☐ ELECTRUNITE Steel Tubing
☐ Republic Cold Drawn Carbon Corrected Bars
☐ Republic Electro Paintlok
☐ Republic ENDURO® Stainless Steel

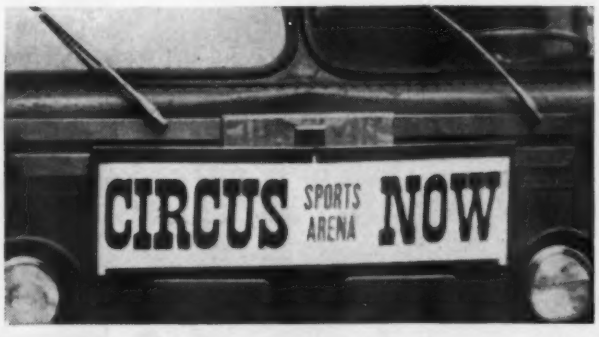
Name_____ Title_____

Firm_____

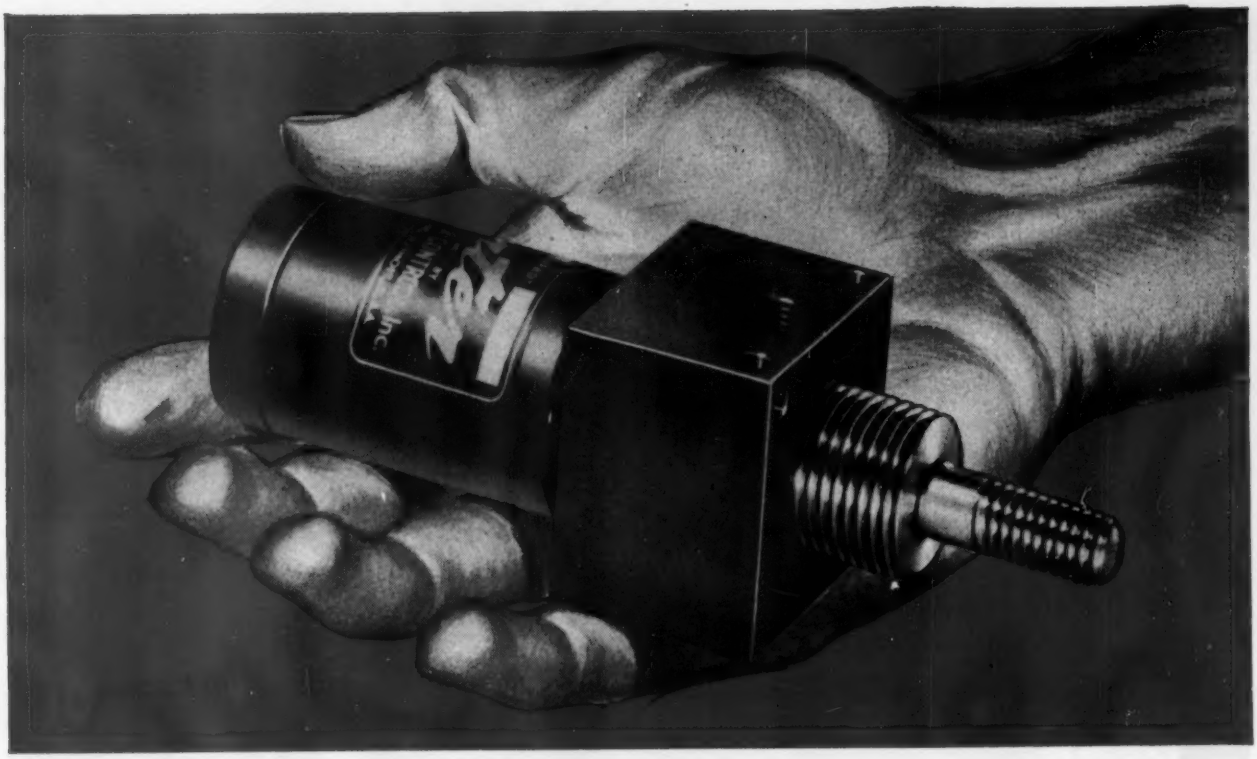
Address_____

City_____ Zone____ State_____

K-8725



COSTS CUT 8%. That's the result of using Republic Electro Paintlok for these traveling poster frames, manufactured by The Yarder Manufacturing Co., Toledo, Ohio. Electro Paintlok is Republic's zinc-coated sheet steel that's chemically treated to take paints, lacquers and synthetic enamels . . . and to hold them for years. It cuts pre-paint cleaning and degreasing costs, welds readily, is easy to fabricate. If you paint on steel, write for facts about Republic Electro Paintlok.

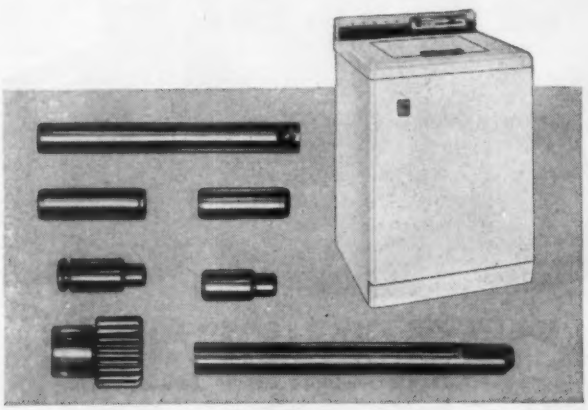


THE OLD WAY

1. Cut to length.
2. Size and burnish inside surface by pressing ball through tube.
3. Thread short lengths which are subject to distortion.
4. Cost ratio: 214

THE ELECTRUNITE WAY

1. Feed long lengths of precision ELECTRUNITE Tubing into automatic screw machine; roundness is unaffected by cutoff and threading.
2. Cost ratio: 100



NORGE REDUCED COSTS 16% on automatic-washer parts. They did it by switching to Republic Cold Drawn Carbon Corrected Steel, and eliminated a costly carburizing operation. Machinability is good and quality of the parts improved. Republic's carbon correction restores carbon lost during hot rolling, restores it right out to the edge of the bar. No need to buy oversize bars to allow for surface removal. Norge saves both metal and money. You can, too. Write Republic.

HERE, REPUBLIC ENDURO STAINLESS STEEL DIDN'T SAVE, IT EARNED! Wouldn't you spend $9 to make $40? Fixible Manufacturing Company did just that when it switched to Republic ENDURO Stainless Steel as the material for public rental lockers. Compared with previous costs for painted lockers, ENDURO cost about 9% more. But, the bright, attractive stainless steel attracts 25% to 40% added revenue. ENDURO is bright, attractive, easy to care for. You can't wear it out. Neither can high traffic locations. Republic will help you apply it advantageously, economically. Send coupon.

EVOLUTION of MULT-AU-MATIC PROGRESS

Since 1914 the Bullard Mult-Au-Matic has reflected engineering and design progress required to fulfill industry's needs — until today, the Type "L", is the optimum for machines of its type.

Here are some of its features...

CONTROL SYSTEM

Advanced design of electro-hydraulic controls provide a readily accessible and simple control system for both Set-Up and Automatic machine operation.

FEED MECHANISM

Completely new screw type feed works insures smooth constant rate of advance of tool slides through any desired part of a 16" stroke with 81 feed changes ranging from .0025 to .0625.

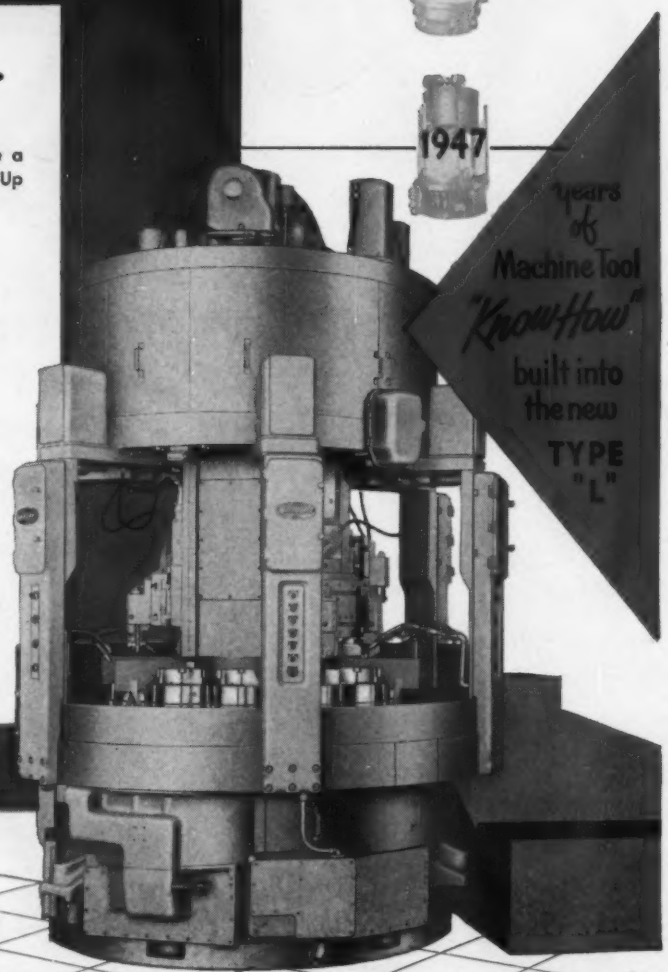
SELECTIVE SPINDLE SPEEDS

Range from 35 r.p.m. to 1,000 r.p.m. at each station providing the correct cutting speed to suit the specified operation.

CARRIER INDEX

The new indexing mechanism with improved carrier column bearing permits faster index of spindle carrier thereby reducing time between cuts. New design index mechanism registers and locks carrier, on successive indexes, to within ±.0005.

SEVENTY FIFTH 1880 BULLARD 1955 ANNIVERSARY

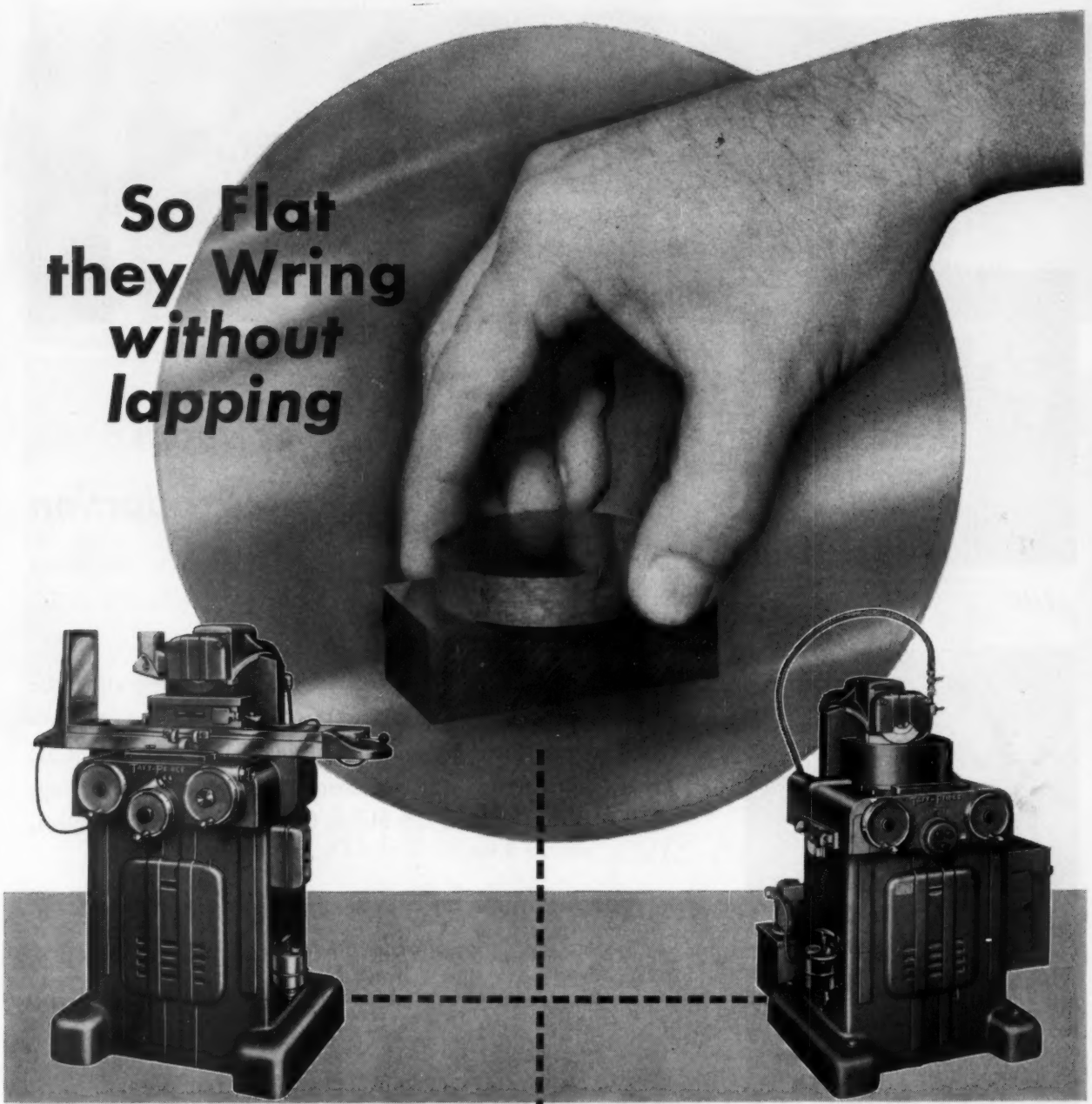


WE INVITE YOUR INQUIRIES
CALL OR WRITE YOUR NEAREST
BULLARD SALES OFFICE,
DISTRIBUTOR OR . . .

MULT-AU-MATIC TYPE "L"
Available in three sizes
10" with 6, 8, 12 or 16 spindles, 14" and 18" with 6 or 8 spindles.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

So Flat they Wring *without lapping*



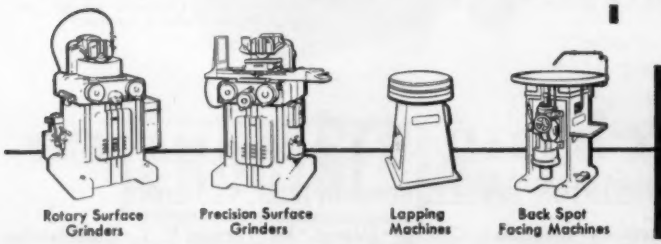
Ground on a Taft-Peirce No. 1 SURFACE GRINDER

Hard to believe but true, this Taft-Peirce No. 1 Surface Grinder, with verniers, produces surfaces of an accuracy, flatness, and finish formerly considered difficult or impossible to achieve. Experienced operators frequently can grind to .00005″, with surfaces so accurate they wring . . . so smooth they seal without lapping.

and a Taft-Peirce 6″ ROTARY GRINDER

Developed for our own shop, T-P 6″ Rotary Grinders make fussy precision work easier and faster than ever before. Vernier feed provides .0001″ vertical settings . . . frequently permits grinding surfaces so smooth they seal without lapping. Tilting Wheelhead tips 30 degrees below center. Superpower magnetic chuck turns through 15 degree angle.

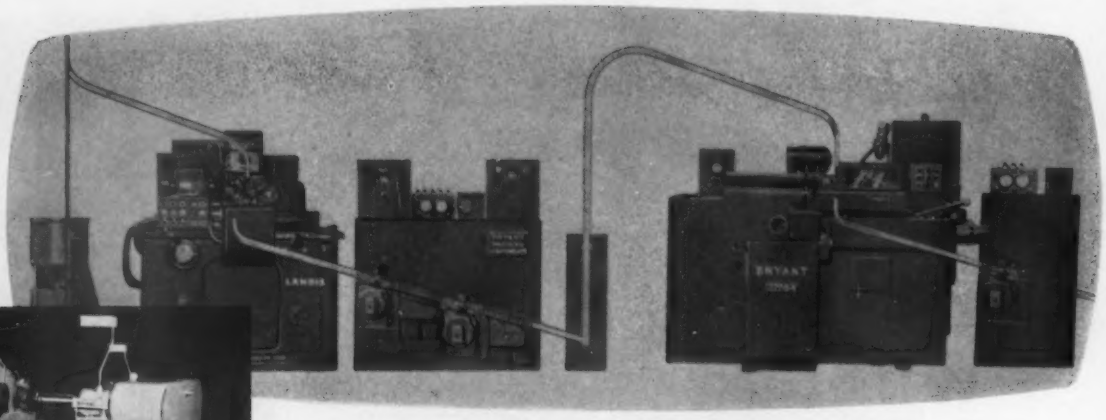
For the complete story on these items and many more, send for your copy of the Taft-Peirce Handbook.



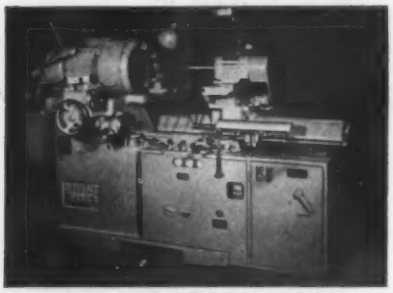
Rotary Surface Grinders | Precision Surface Grinders | Lapping Machines | Back Spot Facing Machines

T-P means Top Precision T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND



plus *Combined bore and face grinding.* 1316-J Bryant performs two or more operations at a single chucking. Two wheelheads on a single wheelslide provide exceptional speed, accuracy and versatility.



plus *Extreme accuracy and fine finishes.* The 1116-X features an extra fine cross feed. Designed for ease in grinding to close tolerances of size, out of roundness and finish.

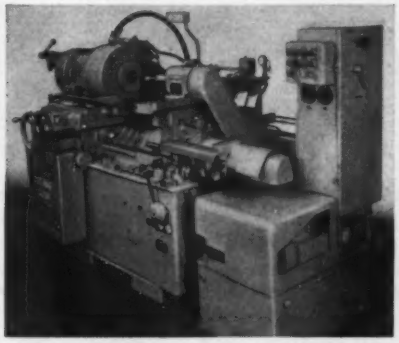
plus *Uniform fine finishes, utmost accuracy* and peak production on the Bryant 998 Precision Boring Machine . . . in precision boring, drilling, turning, facing, grooving, contour boring and turning.

Equally Suited to Toolroom or High Volume Production

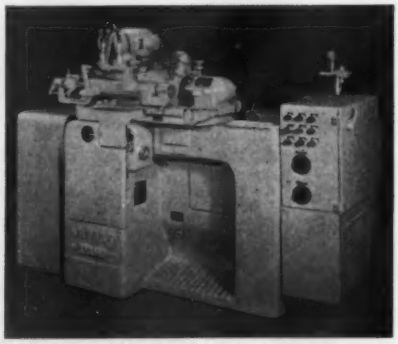
Whether your main interest lies primarily in tool room production, or in automated production lines, you will be interested in what Bryant has to offer.

A complete line of internal grinders, incorporating the exclusive Bryant alignment features, is available. These machines can be equipped with such cost-cutting features as Bryant air sizing, for extremely accurate sizing, shoe centerless grinding, and the Bryant Process Controller, for automatic sizing control.

Free literature on Bryant machines and methods available on request.



plus *Constant production in bore grinding.* The 3216 Bryant Automatic features automatic cycling for high production precision grinding.



plus *High production grinding of small bores.* Control of this Bryant 1209-Y with the Bryant Process Controller provides automatic statistical quality control.

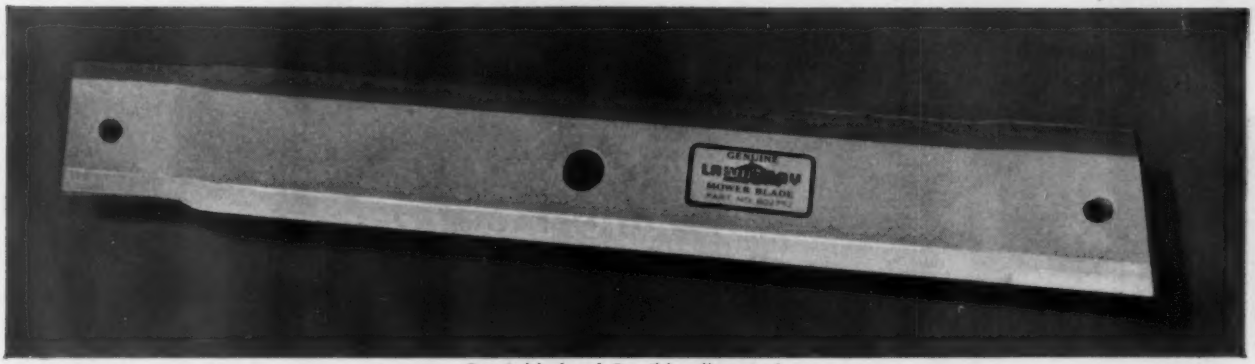
BRYANT

chucking grinder co.

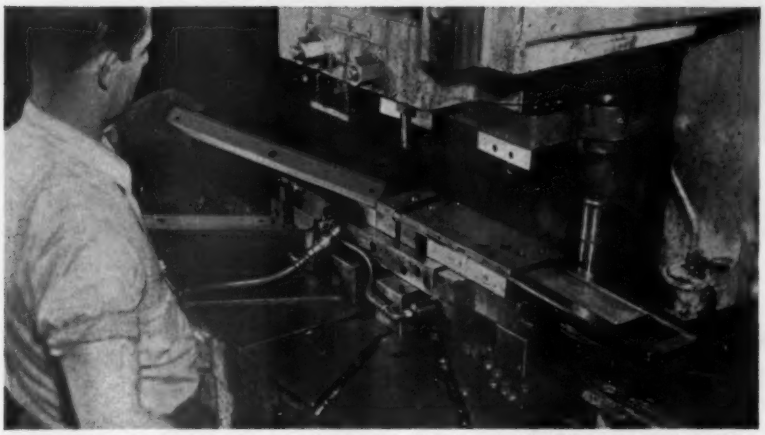
10 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

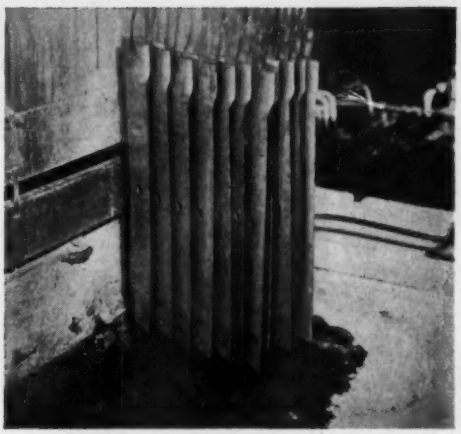
Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates



Cutter blade of Crucible alloy steel.



First step in manufacture of cutter blade. Crucible beveled blade alloy steel is fed through this 100-ton press, where it is cut to length and holes punched.



Next, lengths are formed to shape on a hydraulic press, and then given a tempering bath as shown.

CRUCIBLE ALLOY STEEL *cuts blade damage in rotary mowers . . .*

Lawn-Boy mower. Built by RPM Manufacturing Co., Lamar, Mo., a subsidiary of Outboard, Marine & Manufacturing Company, maker of Johnson & Evinrude outboard motors.

Rotary lawnmower cutter blades, whirling at high speeds, often hit small rocks or bits of trash. Ordinary steels just can't take that sort of rugged treatment. They chip, crack — wear out far too quickly. That's why in leading mowers, like the new *Lawn-Boy*, you'll find special *alloy* steel cutter blades *designed for reliable performance.*

For Crucible has developed a *special alloy steel* made to give the best possible combination of toughness and hardness for long-lasting edges—and formability and ductility for ease of manufacture. It's been so successful that *Crucible is now the largest producer of lawnmower steels.*

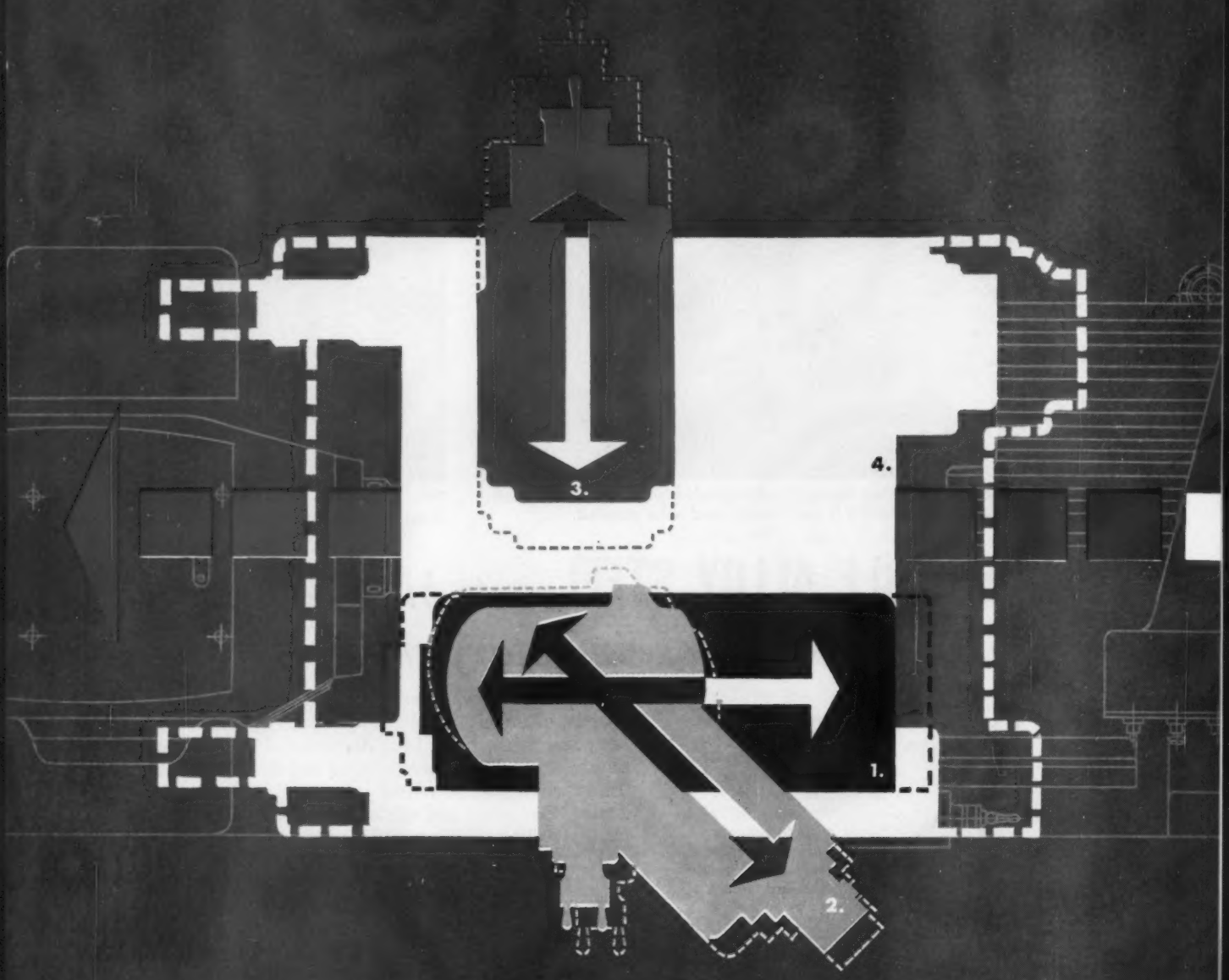
Most Crucible steels are designed to fill *special* needs. If you have an application where ordinary steels won't do, come to Crucible. Take advantage, too, of the dozens of technical booklets and data sheets Crucible has prepared to help you make the best use of special steels. For a free publication catalog, write *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

ACTION That's the Word for Hydra-Slide!

ARROWS SHOW SLIDE MOVEMENTS OF MONARCH'S NEW AUTOMATIC CYCLE CHUCKING LATHE



1, 2. Basic unit, most models—hydraulically operated front slide unit, on which is mounted famous Monarch Air-Gage Tracer. Utilized generally for straight or contour turning, facing, or boring.

3. Hydraulically operated rear slide unit for necking and grooving—is ideal with proper tool setting for facing, for which hydraulic automatic tool relief is provided.

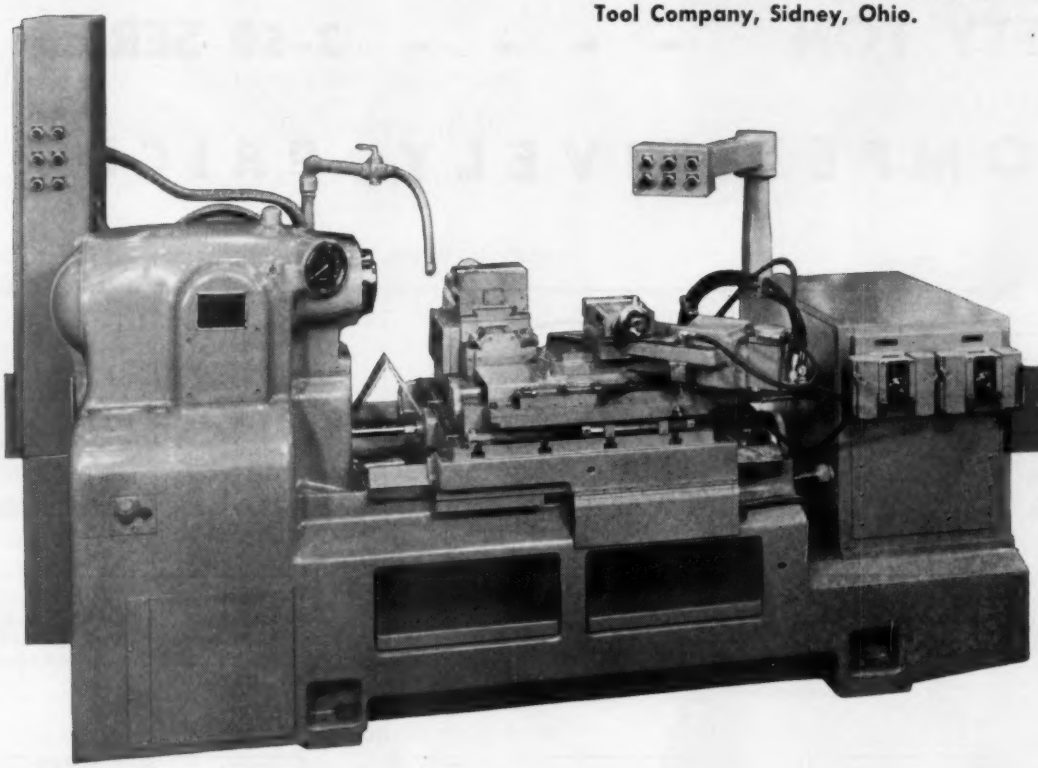
4. Platen with hydraulic movement, on which both front and rear slide units are mounted. Speeds cycle for work piece change!

HERE'S ACTION in the fight against rising production costs—with a fully automatic cycle controlling an extremely effective combination of hydraulic slide movements. Look them over! Here's an exceptionally versatile, high production chucking lathe for both first and second operation work.

Although the typical cycle presumes a tool or tools on both front and rear slides, and is based on the ideal production-wise situation of simultaneous operation of slides—the versatility of the machine is such that many variations can be set up. Of course, there are convenient all-electrical controls for effortless and positive setup.

The Hydra-Slide has ample capacity as to work size and stock removal both, with work diameter capacity up to 15" over front slide unit —up to 13" over rear slide unit—and work drive motor ratings up to 20 H.P.

Here's action—production-wise and cost-wise! You should know *all* about a machine like this. Send the coupon today for our complete illustrated booklet #1703—**The Monarch Machine Tool Company, Sidney, Ohio.**



The Monarch Hydra-Slide. Front Slide, with Air-Gage Tracer, provides smooth, stepless cut for multiple diameters, tapers, faces, radii and chamfers with single-tool economy. One or more tools on rear unit neck, groove, form cut, and face. Both mounted on platen. Send coupon for complete story.

Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

THE MONARCH MACHINE TOOL COMPANY
SIDNEY, OHIO

Please send me your illustrated booklet #1703 on the new Monarch Hydra-Slide.

NAME_____ TITLE_____

COMPANY_____

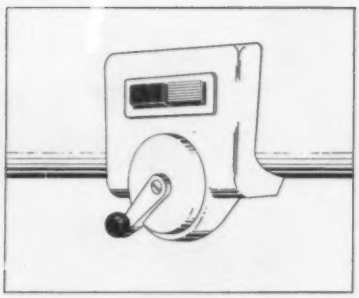
ADDRESS_____

CITY_____ ZONE_____ STATE_____

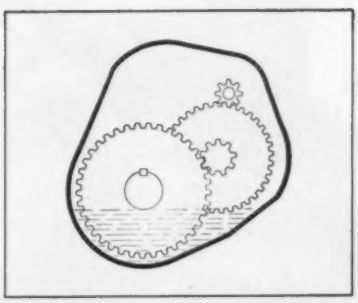
2 New CINCINNATI PRESS BRAKES

THIRTY TON - - - - 2-30 SERIES
FIFTY TON - - - - 3-50 SERIES

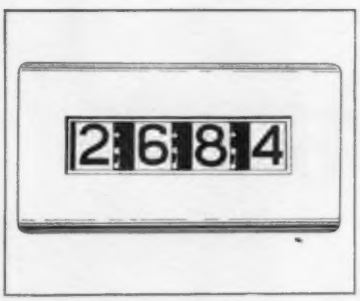
COMPETITIVELY PRICED



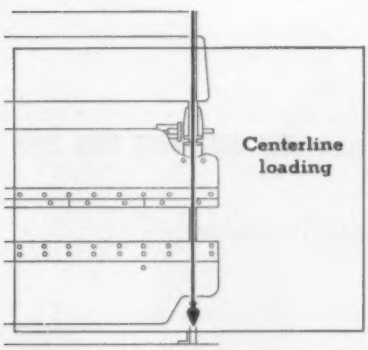
Front controlled, variable speed drive, 20 to 50 strokes per minute.



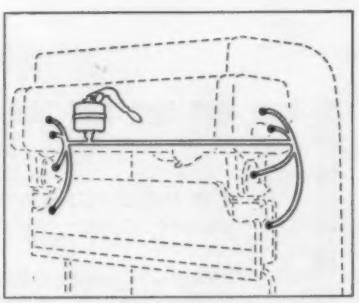
Completely enclosed transmission, running in oil.



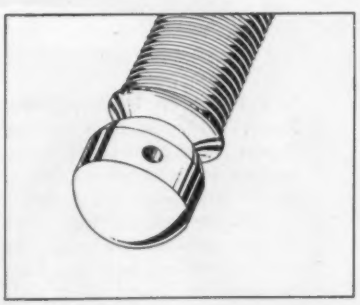
Two micrometer indicators, one at each end of the ram—easy to read and accurately record the amount of adjustment and tilt.



Centerline loading prevents weaving of the housings and insures accurate bends.



Centralized pressure lubrication system.



Ball end on the ram adjusting screws permits tapering of the ram for fade-out work.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

2-30 SERIES

This new 2-30 Series Cincinnati All Steel Press Brake has a capacity of 14 gauge x 6′ mild steel.

Look at these unusual standard features:

2½″ stroke—12″ shut height—9″ throat.

Distance between housings 5′-2″—overall die surface, 6′-0″.

Front controlled, variable speed drive, 20 to 50 SPM. 4″ manual ram adjustment including ram tapering adjustment for fade-out work (power adjustment available as extra feature).

Bronze swivel end-guide bearing for accurate endwise alignment, even when tilting ram.

Brushless electro-magnetic brake and clutch.

Deep bed and ram, planed and drilled for 5¾″ angles.

Micrometer indicators on both ends of ram for fast, accurate setting.

3-50 SERIES

These new 3-50 Series Cincinnati All Steel Press Brakes are built in two lengths and have a capacity of 10 gauge x 6′ mild steel. Investigate these unusual standard features: 3″ stroke—12″ shut height—12″ throat—distance between housings 6′-6″ or 10′-6″—overall die surface 8′-0″ or 12′-0″—front controlled, variable speed drive, 20 to 50 SPM.

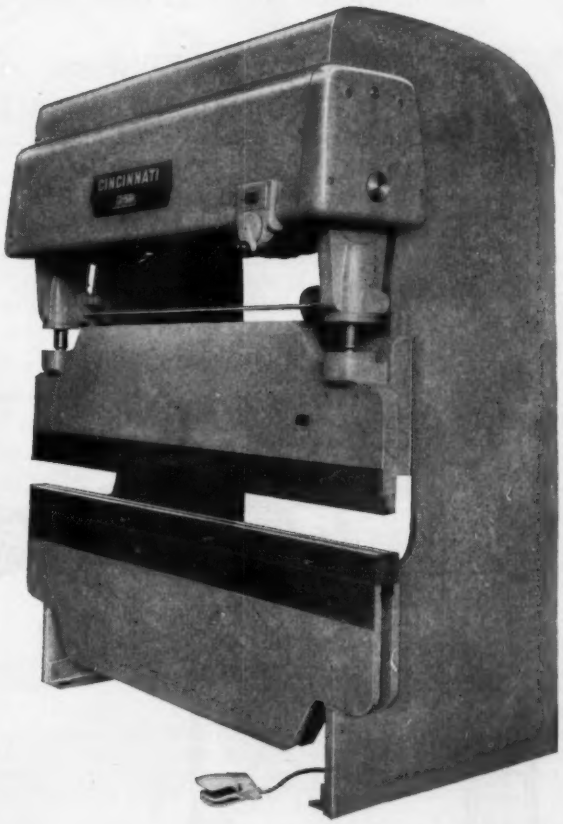
5″ motorized ram adjustment, including ram motor and control, complete with ram tapering adjustment for fade-out work.

Bronze swivel end-guide bearing for accurate endwise alignment, even when tilting ram.

Brushless electro-magnetic brake and clutch.

Deep bed and ram, planed and drilled for 5¾″ angles.

Micrometer indicators on both ends of ram for fast, accurate setting.



ACCO products

The WRIGHT Hoist for the Job... Helps Build Production Profits

PURCHASE of WRIGHT Speedway Hoists means more than the cost **PRICE**. It means that you have the very best in plant lift equipment **PLUS** the longest-lived, hardest working hoists with a minimum of **MAINTENANCE** requirements. Production men find them more than the **EQUALS** of any hoists with their easy, smooth-running performance. Their **TOTAL** maintenance is so small and service so easy that "down time" **COST** is hardly considered in plants equipped with WRIGHT Speedway Hoists.

Write our York, Pa. office for any or all of these fully informative bulletins—
Bulletin DH-133B on Frame 1 and 1½ WRIGHT Speedways
Catalog E-54A on Frame 2 and 3 WRIGHT Speedways
Bulletin DH-504 on WRIGHT Electric Roller Chain Hoist

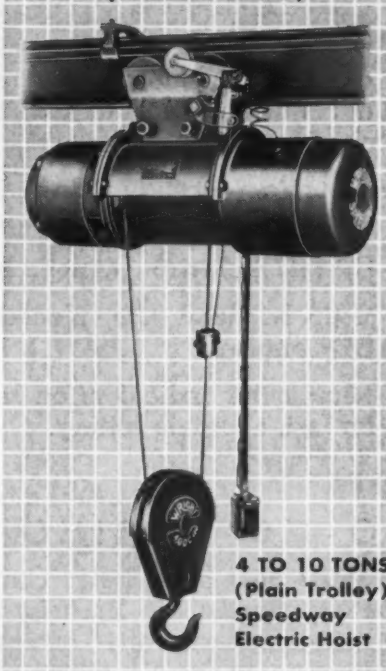
ACCO TRADE MARK

Wright Hoist Division
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Hoists Trolleys Cranes

THE HOIST FOR THE JOB
(Frame 2 and 3)

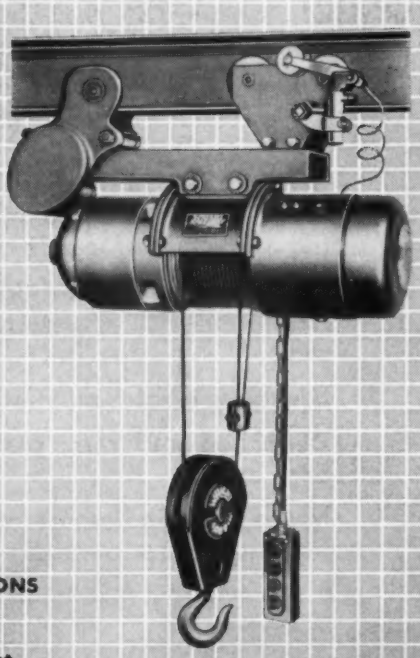


4 TO 10 TONS—
(Plain Trolley)
Speedway
Electric Hoist

¼ TO 2 TONS
WRIGHT Electric
Roller Chain Hoist

¼ TO 1 TON
Speedway
Frame 1
Electric Hoist

1½ TO 2 TONS
Speedway
Frame 1½
Electric Hoist

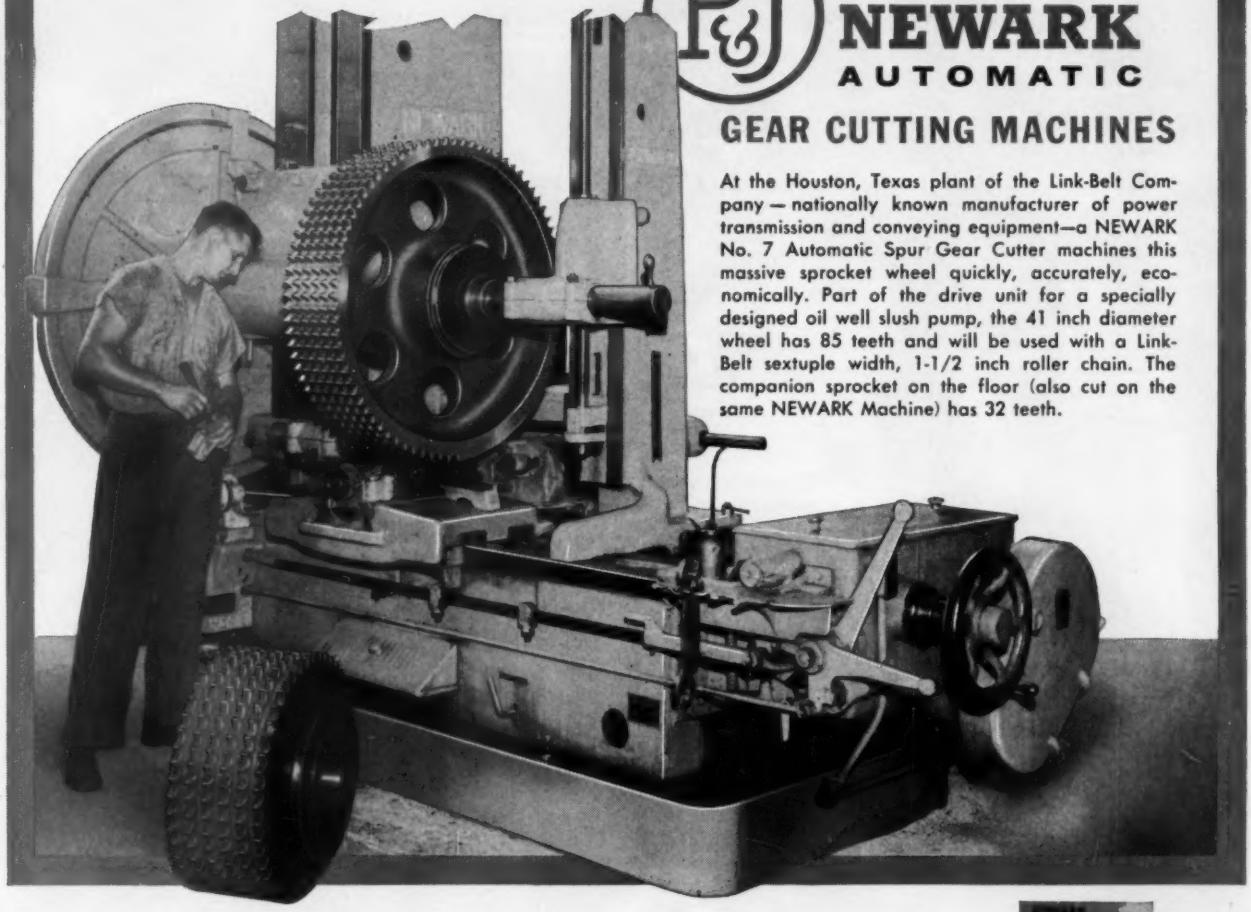


½ TO 6 TONS
(Motor Driven Trolley)
Speedway
Electric Hoist

Specialists who KNOW rely on

P&J NEWARK AUTOMATIC

GEAR CUTTING MACHINES



At the Houston, Texas plant of the Link-Belt Company — nationally known manufacturer of power transmission and conveying equipment—a NEWARK No. 7 Automatic Spur Gear Cutter machines this massive sprocket wheel quickly, accurately, economically. Part of the drive unit for a specially designed oil well slush pump, the 41 inch diameter wheel has 85 teeth and will be used with a Link-Belt sextuple width, 1-1/2 inch roller chain. The companion sprocket on the floor (also cut on the same NEWARK Machine) has 32 teeth.

POTTER & JOHNSTON - NEWARK

Assets of the Newark Gear Company have recently been acquired by **POTTER & JOHNSTON**, subsidiary of Pratt & Whitney, Division Niles-Bement-Pond Company. In addition to the complete line of P&J Automatic Turret Lathes, these long-famous automatic gear machines are now being manufactured in our Pawtucket, Rhode Island plant, and are made available through Pratt & Whitney factory-direct representatives.

SEND NOW FOR COMPLETE INFORMATION

P & J NEWARK Automatic Gear Hobbers and Spur Gear Cutters produce helical and herringbone gears, worm wheels and spur gears accurately and economically; they are easy to set up and operate. Several models are manufactured to handle a very wide range of work requirements. Product literature—including complete specifications and engineering data—is yours for the asking. Write on your Company letterhead direct to Pawtucket outlining your requirements . . . or simply phone the Pratt & Whitney Branch Office nearest you.

POTTER & JOHNSTON CO.

PAWTUCKET, RHODE ISLAND

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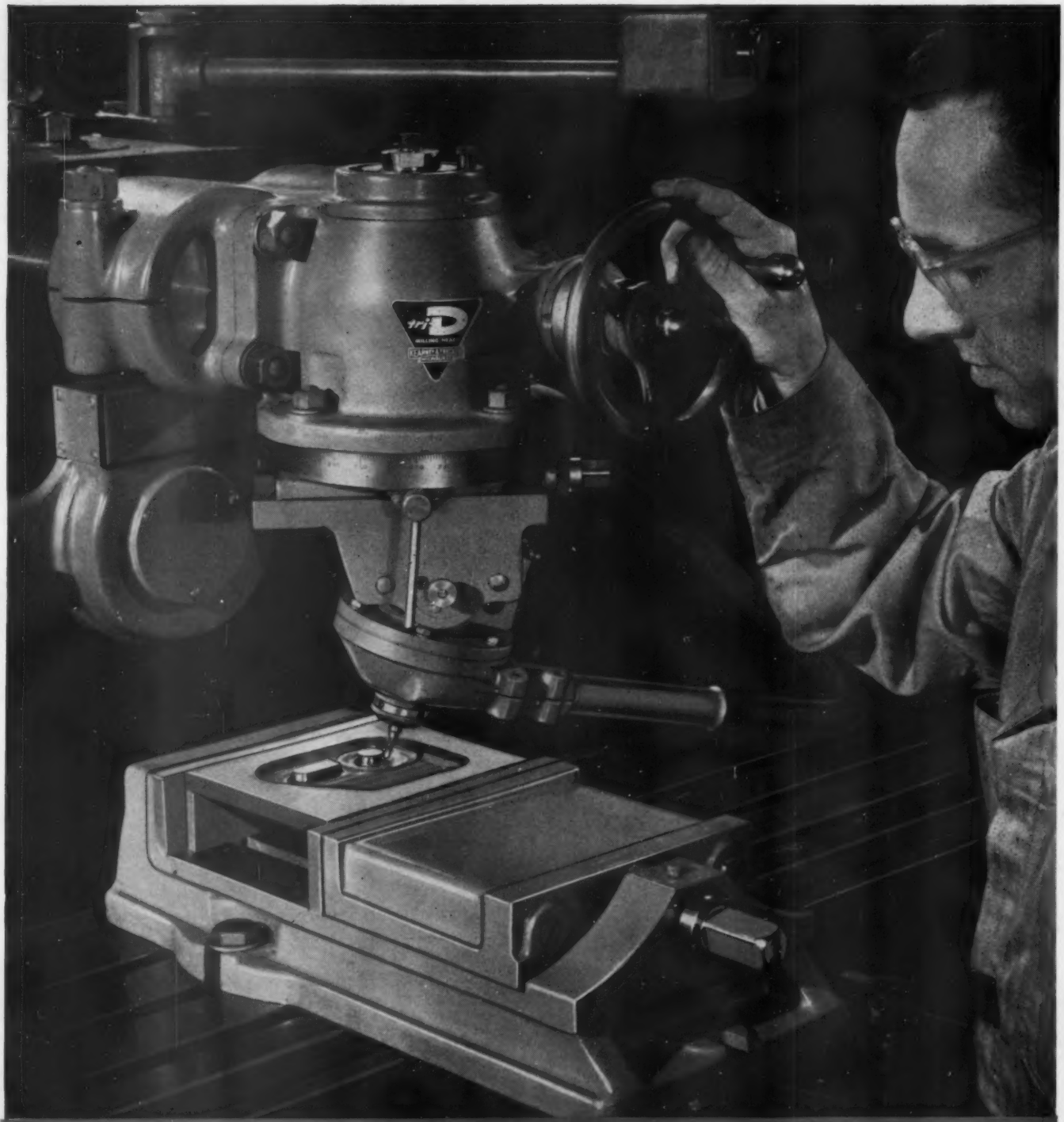
BRANCH OFFICES: BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI CLEVELAND • DETROIT • LOS ANGELES • NEW YORK • PHILADELPHIA PITTSBURGH • ROCHESTER • SAN FRANCISCO • ST. LOUIS EXPORT DEPT., PAWTUCKET, RHODE ISLAND. AGENT: HOUSTON, WESSENDORFF, NELMS & CO.

PRECISION PRODUCTION TOOLING

P&J NEWARK GEAR CUTTING MACHINES

FOR MORE THAN FIFTY YEARS

Mill circles and angles in



Angular adjustment of cutter in the vertical plane is an exclusive feature of the TRI-D Milling Head. Here, operator performs finish milling on intricate workpiece requiring straight, circular, angular and radii milling . . . *all in a single set-up.*

This job and many others are featured in a 20-minute sound color film, "The Little Showoff." Write on your company stationery for reservation.

Builders of Precision and Production Machine Tools Since 1898

one set-up with

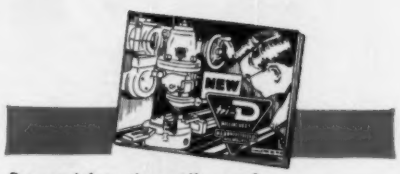
For tool rooms, die shops or production milling—do it faster, easier with new TRI-D Head

Kearney & Trecker's new TRI-D Milling Head — featuring rotary movement, lateral and angular adjustment in vertical plane — measurably cuts production milling costs . . . eliminates multiple set-ups . . . produces more in less time. As illustrated, the TRI-D attachment is ideally suited for rough and finish milling of various geometric shapes—straight lines, radii, circles, angles — all in a single set-up. What's more, it's adaptable for quick and easy mounting on almost all horizontal and some vertical milling machines . . . *regardless of make.*

Learn what TRI-D can do for you—how different it is from all other types of milling heads. Your Kearney & Trecker representative will be glad to arrange a "proof-positive" demonstration without any obligation. Contact him today, or write Kearney & Trecker Corporation, 6784 W. National Avenue, Milwaukee 14, Wisconsin.

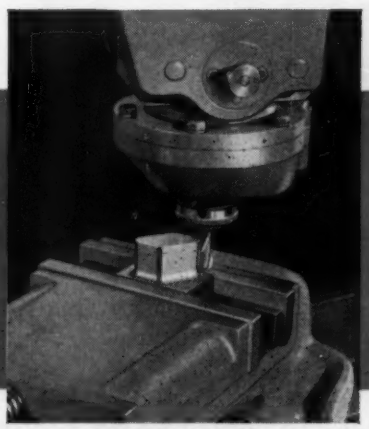
tri-D® MILLING HEAD
KEARNEY & TRECKER MILWAUKEE

Pat. No. 2286821
Other Pat. Pend.

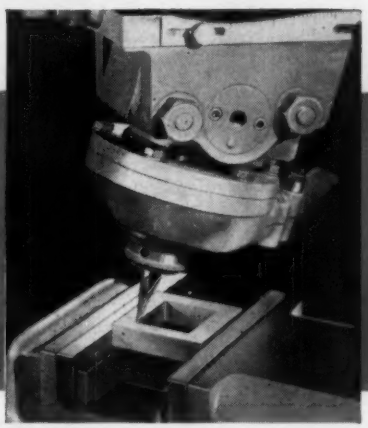


For more information on Kearney & Trecker's new TRI-D Milling Head, write for catalog No. TD-10.

Die (left) and punch (right) are rough and finish milled in a single set-up, using all three basic movements of the TRI-D and universal milling machine. Table is swiveled for milling straight side of both workpieces. Table movement is



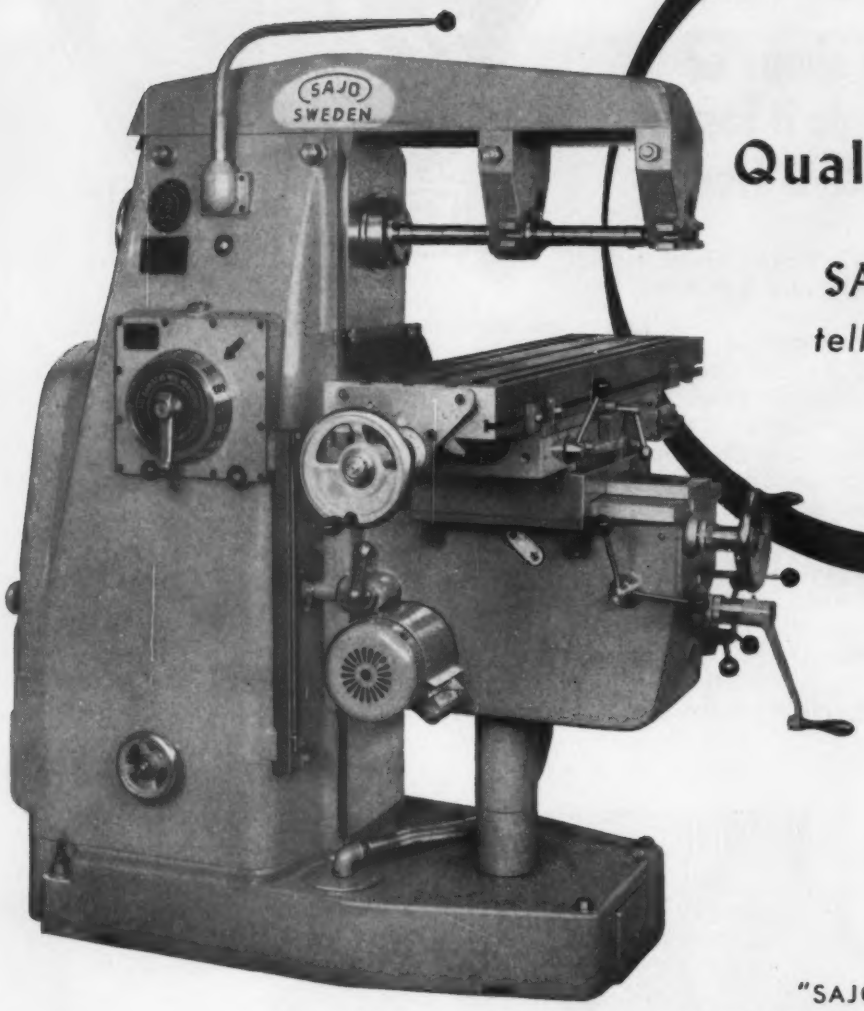
used to mill the long straight side. TRI-D is rotated. Saddle feed is engaged to mill short straight side. At tangent of next radii, saddle feed is disengaged and entire procedure repeated. Clearance angle in die is milled using same dimensions.



TRI-D Head, with an ordinary end-mill ground to a specific angle, is used to finish a "square corner." Adjustment of TRI-D Head and swivel block to prescribed setting and vertical feed of the milling machine is required to do the job.

Kearney & Trecker
CORPORATION
MILWAUKEE 14, WISCONSIN

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS



Quality pays off

SAJO *in operation tells its own story**

"SAJO" and "Quality" are synonymous. The high standards and painstaking Swedish craftsmanship on which the SAJO reputation has been established are faithfully maintained in all SAJO Milling Machines. They are built to assure the accuracy and dependability which mean profitable operation — and their cost is surprisingly low. Available in 3 models!

Model 54 (illustrated) a full No. 2 capacity ALL-GEARED Miller — Plain or Universal types — 7½ HP motor (5 HP optional) — 1½ HP table feed motor; #50 NMT spindle; 16 spindle speeds up to 1500 RPM; single lever speed and feed selectors with direct reading dials; single lever control for START-STOP-BRAKE; table power feed and POWER RAPID TRAVERSE in 3 directions. Model 53 Light Duty No. 2 ALL-GEARED Miller. Model 48 Light Duty No. 2 Utility Miller.

**Ask for references*

austin industrial corp.

76-F MAMARONECK AVE., WHITE PLAINS, N.Y.

Look for the Austin Seal — your full guarantee of satisfaction.

praise from Caesar...

The Salt Lake Tribune, Sunday, June 20, 1954
Here's the New McGee and Hogan
Radial Drilling Machine
With its 5-foot arm, this modern machine is capable of driving a 3" diameter drill to capacity through the center of a 10-foot diameter solid steel work piece. Also used for tapping and large boring operations, it is the only really modern radial of such dimensions in any intermountain machine shop doing repair work.
Veteran operator Pat Langford, above, finds the centralizing of all controls on this machine a big advantage over old-fashioned, scattered control points. Time saved means lower costs per job.
McGEE & HOGAN
MACHINE WORKS
1154 South 2nd West - Salt Lake City - 84-5291

When a customer of such outstanding caliber and recognized reputation as the McGee & Hogan Machine Works of Salt Lake City, Utah spends his own good money to tell the world how good his new "AMERICAN" Hole Wizard Radial is that's really "Praise from Caesar."

The accompanying McGee & Hogan advertisement appeared in the Sunday, June 20th, edition of The Salt Lake Tribune. It shows the new 5' 13" "AMERICAN" Hole Wizard Radial at work in their plant producing work for customers at **"lower costs per job."**

Lots of power, wide range, convenient controls and plenty of ruggedness are doing for McGee & Hogan Machine Works exactly what "AMERICAN" Hole Wizard Radials will do for you.

And Mr. Ray Hogan adds another punch to this testimonial by telling us in a recent letter, "Your machines are doing a wonderful job for us."

Send for bulletin No. 327 and get the facts.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes · Radial Drills

You can spot productive hands by the
A few scenes from the Behr-Manning color and sound motion picture . . .

company they keep...

Polishing production "rockets" ahead with Behr-Manning abrasive belts

It's a cinch to bring up superior finishes in record breaking time with BEHR-MANNING abrasive belts. For example, the O.D. of the box end of a wrench (left) is polished in one pass on the belt. Though your operations may be different, chances are these smooth-cutting, versatile abrasive belts will cut man hours and increase output. Try them.

SEE THIS COLOR MOVIE, "Coated Abrasive Belts Speed Metalworking Production". Contains 26 minutes of the latest coated abrasive methods, techniques and machinery.
Address Behr-Manning, Troy, N. Y., Dept. AM-9.

In Canada: Behr-Manning (Canada) Ltd., Brantford.
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.

Contour polishing fluted areas of bits on a 1/2" free-running abrasive belt.

Removing weld bead on tubing with a free-running abrasive belt.

Mirrors for boroscopes are being shaped on this wet abrasive belt grinder.

BEHR-MANNING® *division of NORTON Company*

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

Manpower's amazing and here is the proof:
When shipping costs grew, the boss raised the roof . . .

Now the roof's back in place and the future looks bright,
Swift **RAILWAY EXPRESS** keeps his shipping costs light.

The big difference is

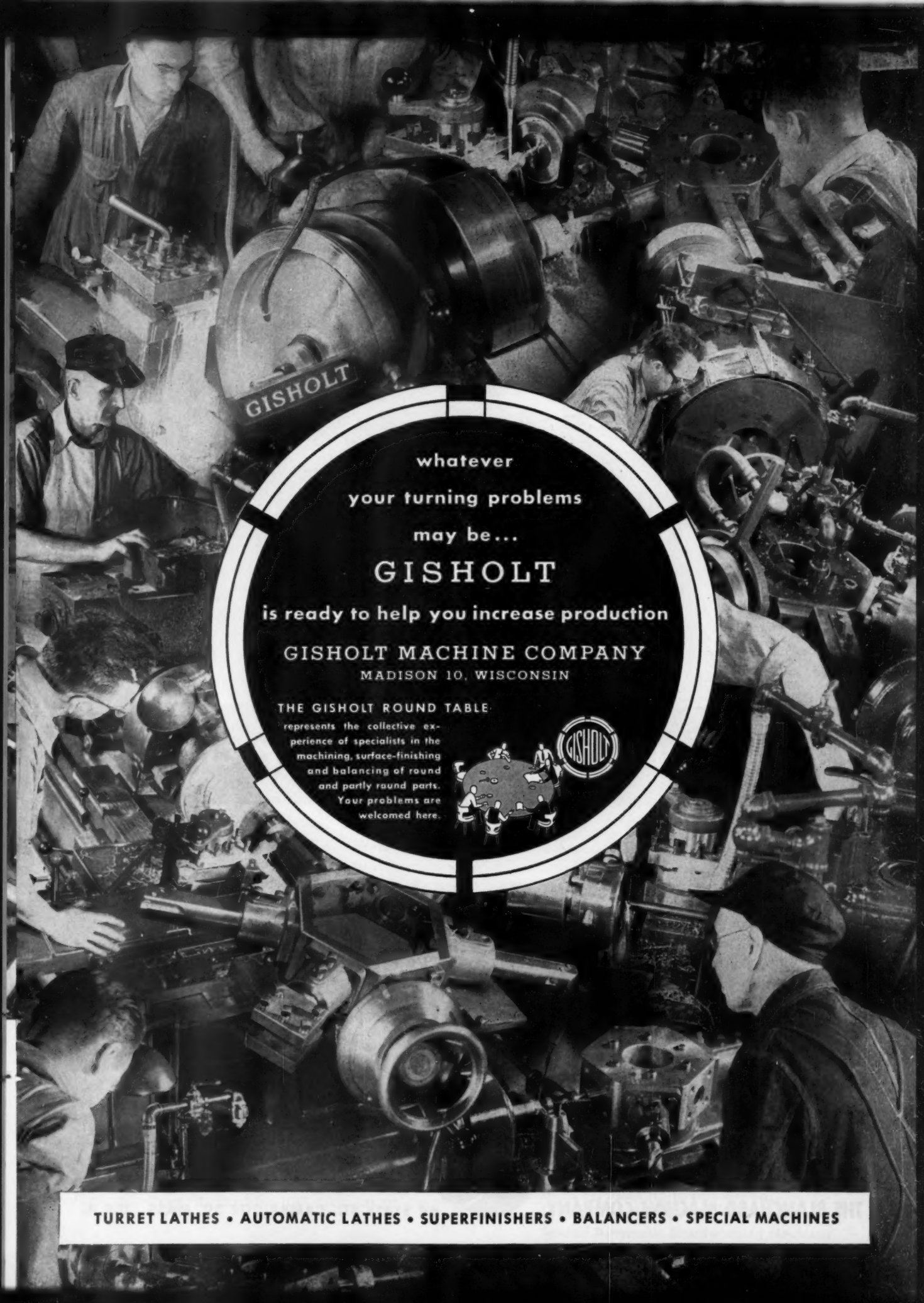
Whether you're sending or receiving, whether your shipment is big or small, and whether it's moving by rail or air—you'll find it pays to specify Railway Express. It makes the big difference in speed, economy, and safe, sure delivery.

• • •

Railway Express uses the facilities of some 480 independent and competitive transportation companies in the movement of express traffic. It's free enterprise at its best, putting at your service one-third of a million miles of co-ordinated rail, air, water, and truck routes that connect all America.

RAILWAY EXPRESS AGENCY

. . . safe, swift, sure


GISHOLT
whatever
your turning problems
may be...
GISHOLT
is ready to help you increase production
GISHOLT MACHINE COMPANY
MADISON 10, WISCONSIN
THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.
GISHOLT
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

16 surfaces

...on this Garrison Gear Chuck

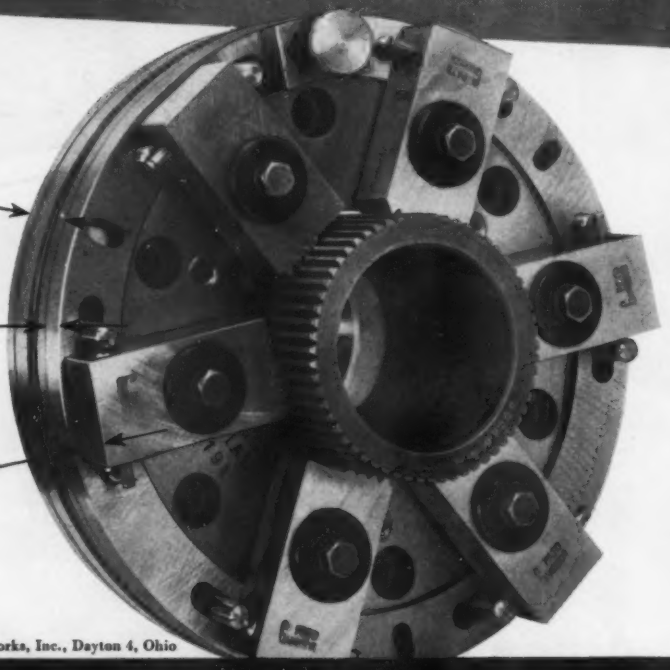


Photo courtesy of Garrison Machine Works, Inc., Dayton 4, Ohio

are Blanchard ground for precision

As every machinist knows, machine tools impart their precision through their chucks. That's why chuck dimensions and tolerances are of critical importance . . . and why Blanchard Surface Grinders are commonly used to produce the flat surfaces required.

Blanchard Surface Grinders are ideal for all kinds of precision grinding jobs. They produce extremely close tolerances for flatness, size and parallelism . . . *at low costs and high production rates.* Many Blanchard users grind surfaces flat to within 2 to 4 light bands, parallel to less than .0001", with dimension tolerance of .0002", and surface finish to better than 3 micro inches.

Whether your work involves precision machining or rapid removal of stock, take the advice of master machinists . . .

PUT IT ON THE BLANCHARD

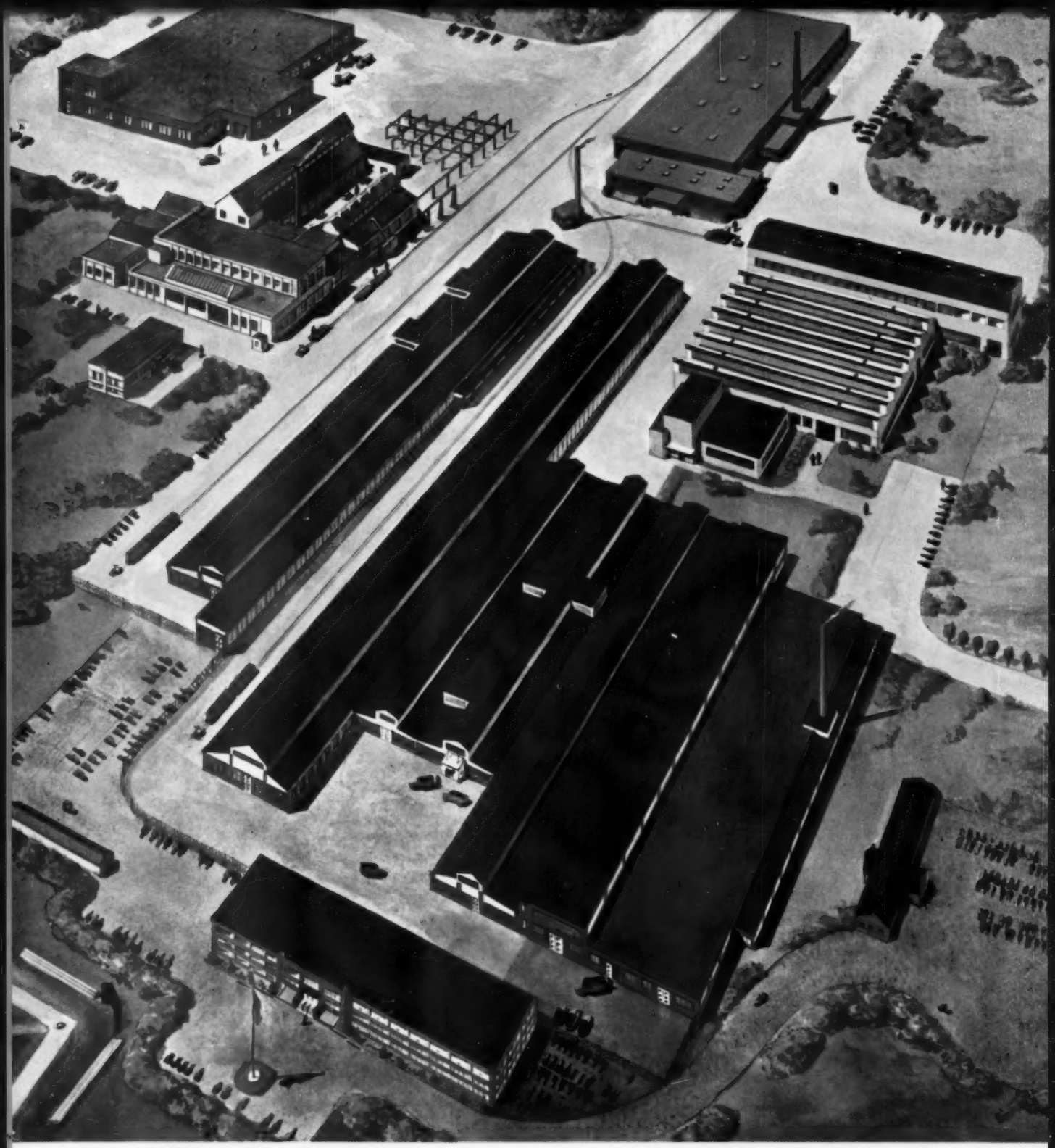
No. 11 Blanchard Surface Grinder

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



This is The New Britain Machine Company . . .

A composite view of The New Britain Machine Company's six plants in New Britain, Connecticut; Springfield, Massachusetts; Cleveland, Ohio; and Dayton, Ohio . . . built on a foundation of sixty years of service to the world's metalworking industries. Its machine tool divisions produce: ➡

- **Automatic Bar Machines**
- **Automatic Chucking Machines**
- **Precision Boring Machines**
- **New Britain +GF+ Copying Lathes**
- **Lucas Precision Horizontal Boring, Drilling and Milling Machines**
- **Special Automatic Metalworking Machines**

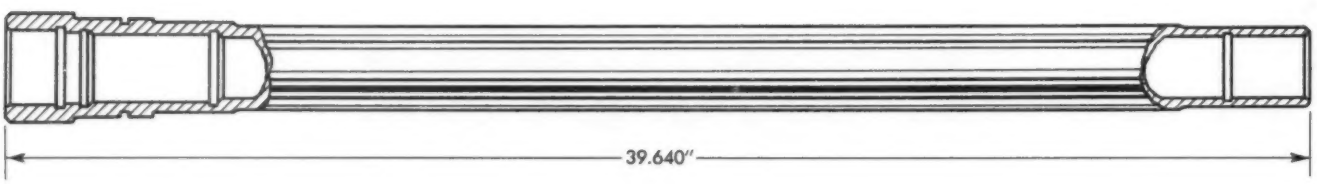
For news of New Britain developments that could improve *your* production methods, see the four following pages.

See it in operation

Ask your New Britain representative for a showing of the color motion picture "A NEW APPROACH TO COPY TURNING." Or write The New Britain Machine Company, New Britain, Connecticut.

This is New Britain's approach to copy turning

Can you find profit opportunities in *your* shop with this new approach? Let your New Britain man help you . . . that's his business.

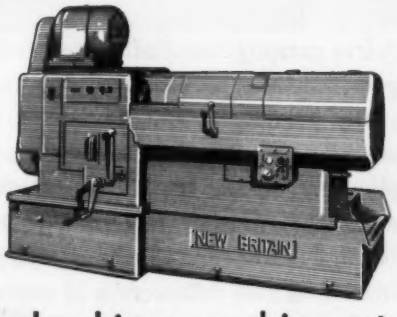


Saves $10 per piece and $3,000 worth of gauges plus labor and overhead on two machines

These are the five operations which formerly required four separate set-ups on three different machines: (1) Rough turn three Outside Diameters, (2) rough turn four Outside Diameters, (3) face large end, center, bore three Inside Diameters, undercut and chamfer three surfaces, (4) face end to length, bore center and undercut, (5) finish turn six Outside Diameters, undercut, form radii and chamfer — all this machining is done in five operations on one New Britain +GF+ Copying Lathe.

New Britains are "naturals" for work like this

New Britain alone makes *both* tool rotating



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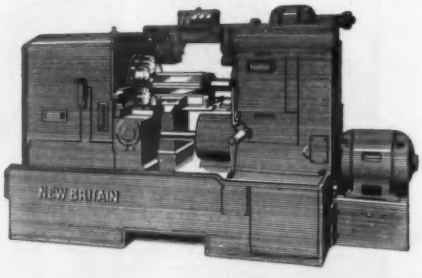
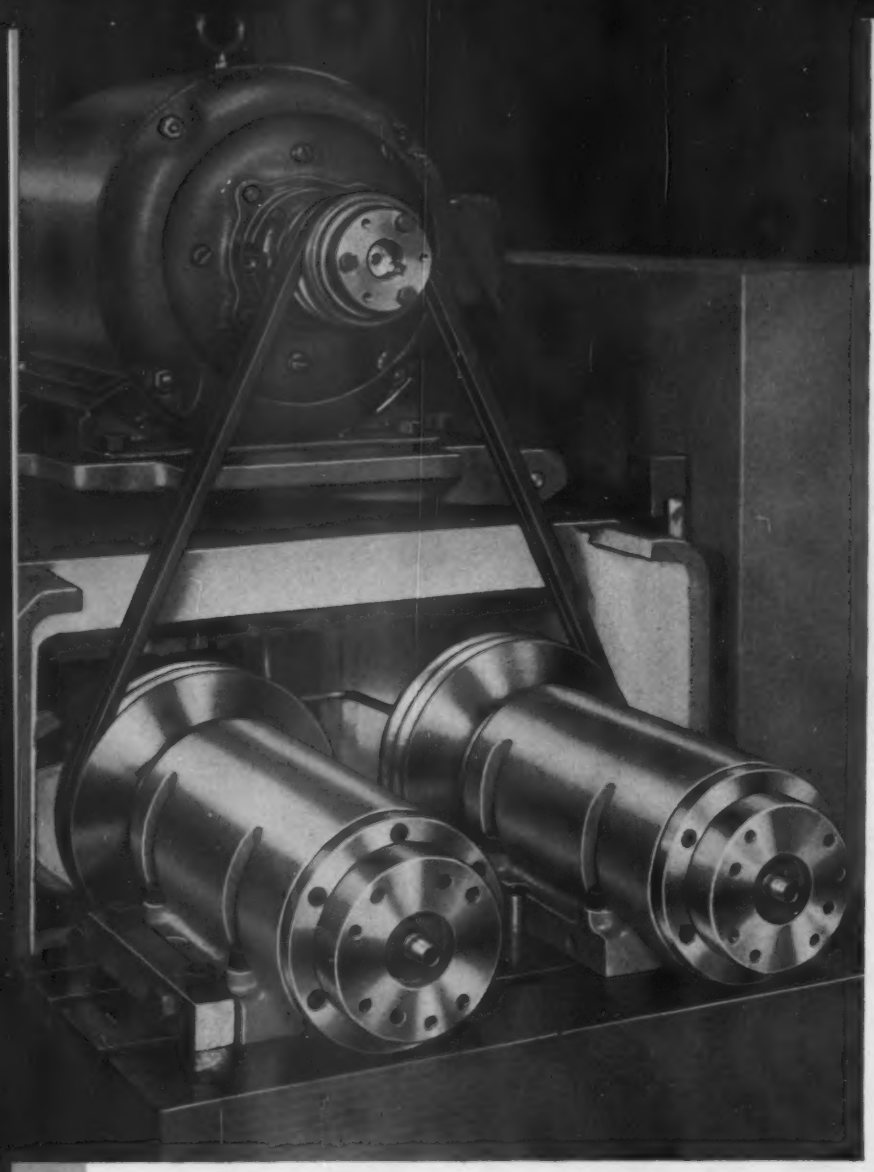


work rotating chucking machines, to provide the best approach to economical production of your work.

The two preceding pages and two following present other New Britain *New's*.



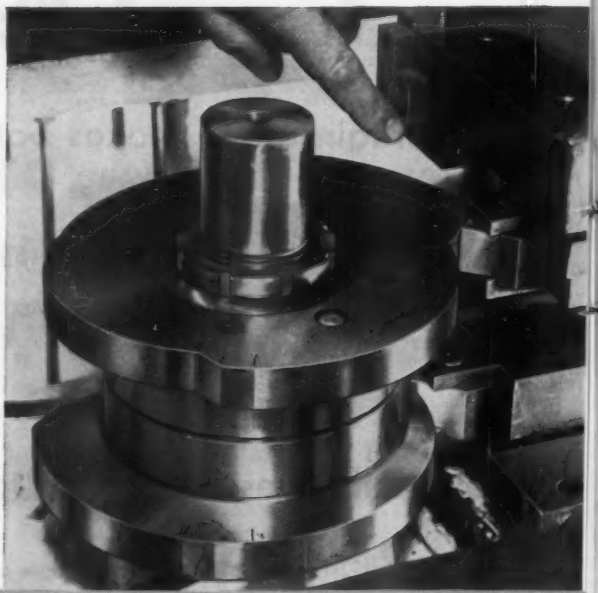
Spindle accuracy is the first essential to holding close tolerances on a boring machine. To utilize this accuracy New Britain spindles are mounted on a stationary bridge securely bolted to the rigid frame of the machine. Drive motor is mounted on a separate bridge above the spindles . . . table is not affected by motor heat and vibration.

Secret of permanent boring machine accuracy:

Pinpoint control protected by the mass of the machine

A true running cam shaft preserves the accuracy of the tool path. Easily accessible precision cams are mounted on a shaft, straddle mounted directly to the frame of the machine (top bearing bracket has been removed in this photo). Top and bottom cam shaft bearings are a minimum distance from the cam. The shaft keeps its accuracy because of this rigid mounting, and also because the thrust from both cam followers is in one direction.

New Britain Precision Boring Machines have provided a new approach to the fast production of problem pieces in America's leading high output plants. Ask your New Britain man or write The New Britain Machine Co., New Britain, Conn., for the book, "24 COST CUTTING JOBS."



This is an easy job for a Lucas

LUCAS OF CLEVELAND

This twenty-foot weldment requires a combination of milling, boring and key slotting, all of which are performed in one setting. Backrest was removed from the machine, and the work is supported on an auxiliary table. *(Photo courtesy Steel Equipment Co., Cleveland, O.)*

This awkward work piece is another demonstration of Lucas flexibility. A LUCAS PRECISION HORIZONTAL BORING, DRILLING AND MILLING MACHINE does a wide range of work easily, accurately and inexpensively. You have ruggedness, accuracy and flexibility of work handling that you can count on.

Automatic power positioning enables you to positively repeat operations on any number of pieces. New ultra-simple pendant control is always at the operator's fingertips. Let your Lucas representative show you how far your machine-tool dollar can go, invested in this most versatile machine in any shop.

LUCAS MACHINE DIVISION
The New Britain Machine Company • Cleveland 8, Ohio

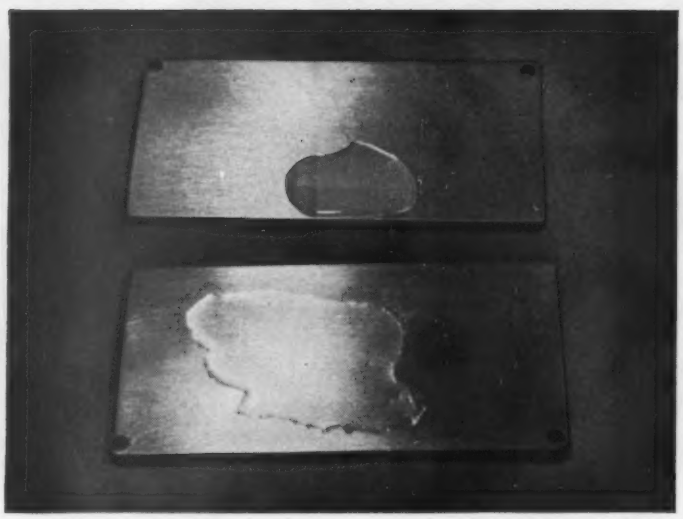
The NEW BRITAIN MACHINE COMPANY

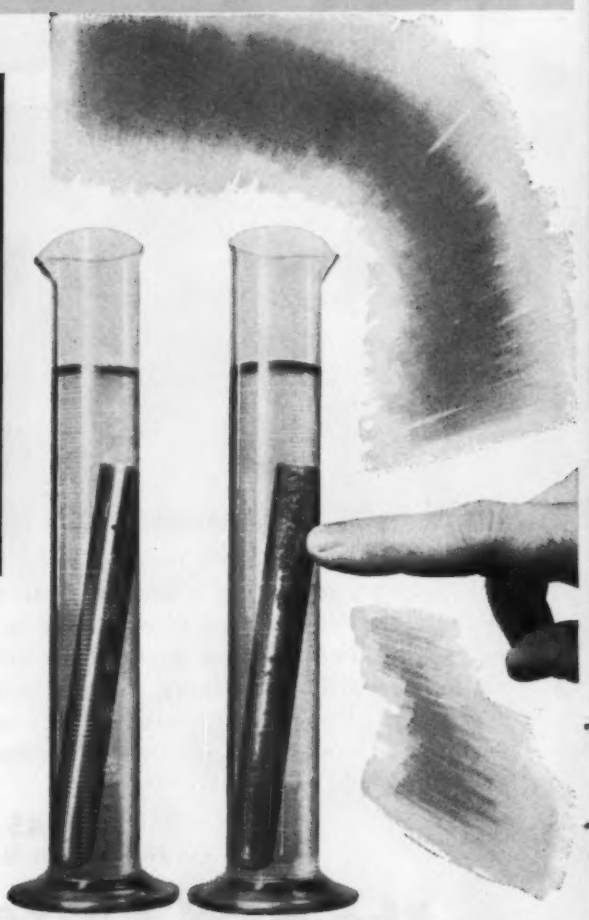
New Britain-Gridley Machine Division, New Britain, Connecticut
Lucas Machine Division, Cleveland 8, Ohio

• AUTOMATIC BAR and CHUCKING MACHINES • PRECISION BORING MACHINES
• LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES • NEW BRITAIN +GF+ COPYING LATHES

See the preceding four pages for other New Britain *New's*.

Announcing
SHELL
DROMUS OIL E





Above: Cooling action of a cutting fluid is directly related to its wetting ability. Conventional soluble oil emulsion (background) "balls" up. Equal amount of Shell Dromus Oil E spreads out thinly . . . wets far greater area.

Right: Plain carbon steel, if left in water at room temperature for about two hours, will rust as shown. Sample on left was in a 1-30 solution of Shell Dromus Oil E and water *for six months without rusting.*

SHELL DROMUS OIL E

NEW CUTTING OIL

permits higher speeds and faster feeds than ever maintained before

Shell Dromus Oil E, a new solution-type fluid, wets all metal surfaces with extreme rapidity and keeps both work and tools exceptionally cool. These qualities permit an increase of machine speeds and/or feeds far beyond anything allowable with conventional soluble oils.

IT'S MUCH EASIER ON TOOLS

There's much more life in any cutter or abrasive wheel when protected by this new oil. *It stays put* between tool and work. (At a 1-30 dilution, average tool life increase in extended field tests was about 50%.)

IT FIGHTS RUST

Shell Dromus Oil E is readily soluble in hot, cold, soft or hard water, and stable in any concentration. Even at low concentrations, it gives excellent rust protection to all ferrous metals, *including cast iron.*

IT KEEPS WORK COOL

Even at stepped-up production rates, you'll find less heating and better finish wherever this new oil is used.

IT SETTLES OUT FAST

Chips and wheel particles settle out immediately . . . the recirculated fluid is clean and free from contaminating particles. It is *not* sticky or greasy . . . leaves no deposits on machines or work.

IT'S GREAT FOR GRINDING

Grinding wheels remain clean, *even when material retains a film of cutting oil from a previous operation.* Even cast iron can be ground cleanly when Shell Dromus Oil E is used to cool the work.

If all this reads "too good to be true," we suggest that you try Shell Dromus Oil E *on any problem operation you have.* It *is* that good!

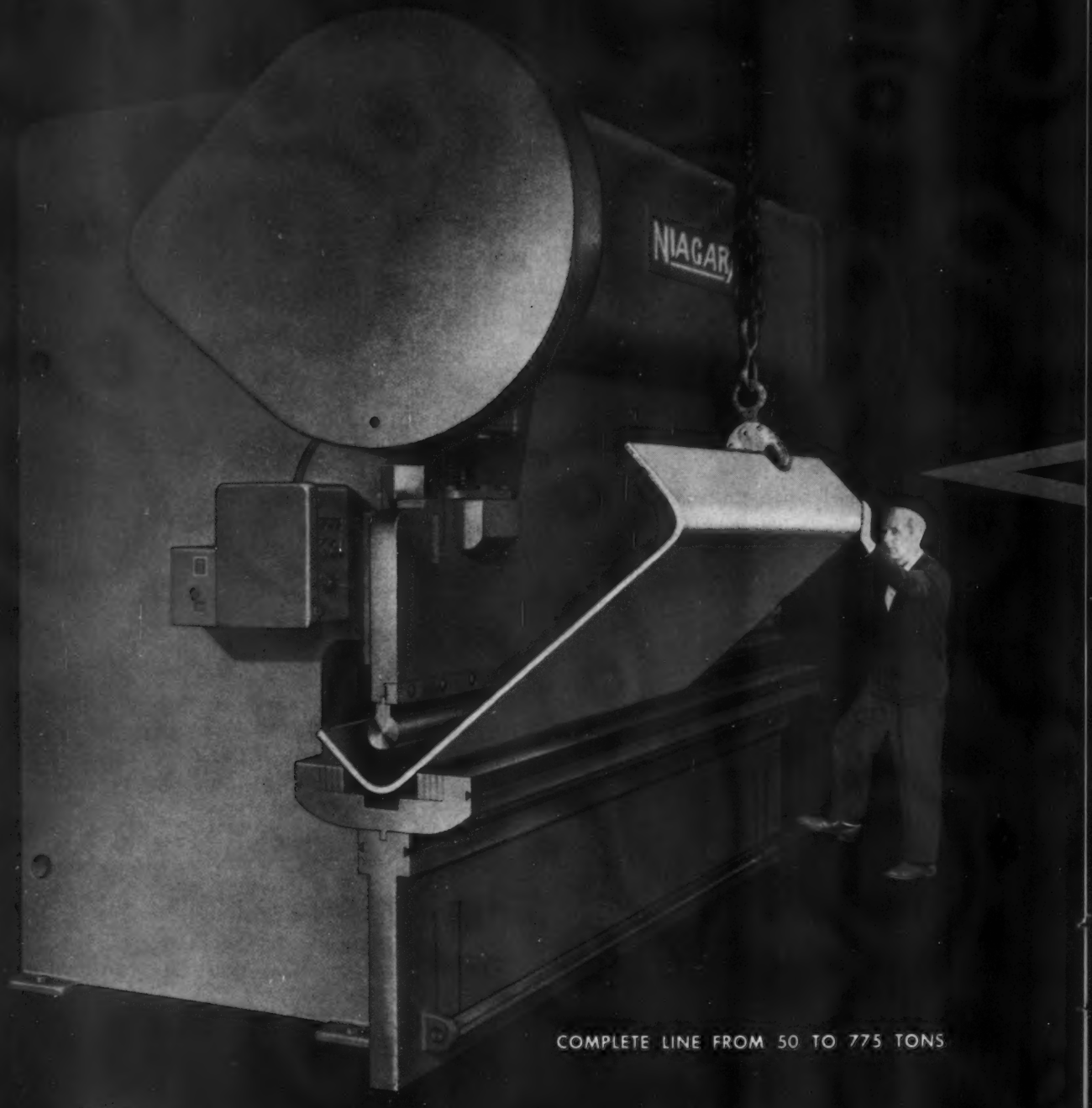
SHELL OIL COMPANY

50 West 50th Street, New York 20, New York
100 Bush Street, San Francisco 6, California

SHELL

IT'S THE NEW, "YEARS-AHEAD" LINE ...

Far out front on every point of comparison



COMPLETE LINE FROM 50 TO 775 TONS

NIAGARA
MACHINE & TOOL WORKS
1879 75 1954

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

... NIAGARA

ALL STEEL PRESS BRAKES

"MULTI-MACHINE" VERSATILITY TO BOOST PRODUCTION

Practically limitless in their scope of forming, bending, punching, blanking and related operations, Niagara Press Brakes get more done for you because they do more jobs. One reason: Advanced design. Another: The extensive line of Niagara Press Brake Dies available.

UNIFORM BENDS WITH STRAIGHT-EDGE ACCURACY

Double end twin drives with double reduction gearing, *on all models*, provide uniform, constant application of power at both ends of the ram. Off-center loading presents no problem.

Rugged, streamlined frames feature box type crowns of unequaled strength and rigidity, assuring maximum resistance to deflection and permanent alignment of bearings and ram.

3-SHIFT STAMINA TO HANDLE WORK-HEAVY SCHEDULES

Close attention has been given to every design detail. Nothing has been overlooked. Each frame size has been scientifically tested to detect and eliminate harmful stresses at all critical points.

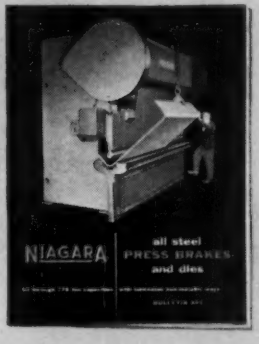
Laminated non-metallic ways, an exclusive Niagara feature, reduce wear to an absolute minimum, providing accurate alignment and longest possible service life. All gearing is totally enclosed in sealed oil baths for thorough, clean lubrication.

Once again, Niagara's forward-thinking engineering has produced a metal working machine years ahead of its time. As you become familiar with the significant developments embodied in this revolutionary new line of all steel press brakes, you will realize why it carries the Niagara nameplate. After all, who is more uniquely qualified to be its builder than the builder of America's most famed and most complete line of presses, shears, other machines and tools for plate and sheet metal work?

Call in your nearest Niagara representative at once. Let him tell you, *in detail*, what these great, new press brakes can do for you.

CHECK ALL THE FACTS, YOURSELF!

Compare. Make a careful, feature-by-feature appraisal of Niagara's years-ahead press brake design. Write for new Bulletin 89C . . . the most comprehensive press brake literature ever published.



NIAGARA MACHINE & TOOL WORKS
BUFFALO 11, N. Y.

DISTRICT OFFICES:
Detroit • Cleveland • New York • Philadelphia
Dealers in principal U. S. cities and major foreign countries

engineered to expand your output ...AT SAVINGS!

"PERFORMANCE HAS ESTABLISHED

LEADERSHIP FOR HARDINGE"

See *American Machinist* August 29th Issue Pages 436-437

The NEW

SERIES "N"

NATIONAL ACME "FETTE"

Self opening

THREAD ROLLING HEAD

for ROTATING and NON-ROTATING Spindles

AS A ROTATING HEAD — Resetting mechanism is operated by a yoke, with handle removed.

A BRAND NEW DESIGN!
makes more of your present machines adaptable for ROLLING threads

the same head works either way!

AS A NON-ROTATING HEAD — Resetting mechanism is operated by handle.

Hard to beat. . . *for adaptability . . . for economy . . . for producing accurate, long-wearing threads . . . for long runs or short runs.*

THE NATIONAL ACME COMPANY, 170 East 131st Street, Cleveland 8, Ohio

ARMSTRONG

SET-UP AND HOLD-DOWN TOOLS

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

T-SLOT CLAMP

NON-SKID JACKS

PLANER JACKS

STEP BLOCK

Write for Circular

Buy ARMSTRONG TOOLS from your Industrial Distributor

UNIVERSAL CLAMP

T-SLOT BOLTS AND NUTS

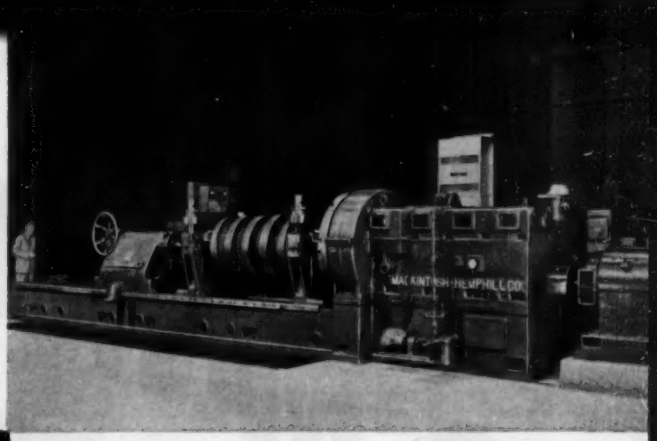
STRAP CLAMPS

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVE. CHICAGO 30, U. S. A.

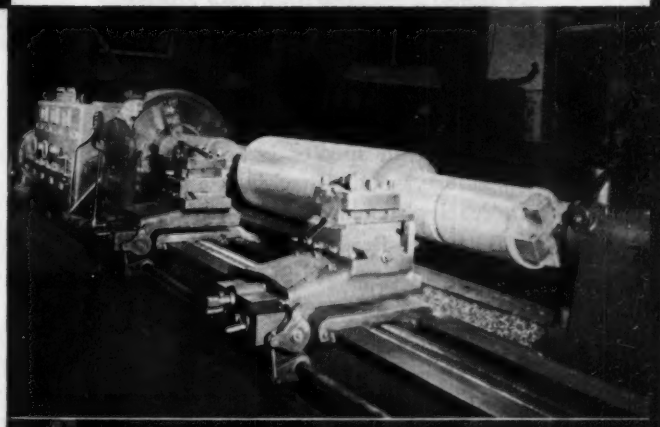
A FASTER WAY TO TURN ROLLS FOR SHAPE MILLS. This unique Mack-Hemp contour turning lathe automatically cuts exact contours in shape rolls weighing up to 35 tons or more. A shaped template guides the tool by means of electronically-controlled long feed and cross feed. This dual feed control is so effective that the lathe can make a smooth, accurate cut even on the side of a shoulder normal to the roll axis. Rate of metal removal ranges up to nine times that of a standard roll lathe.



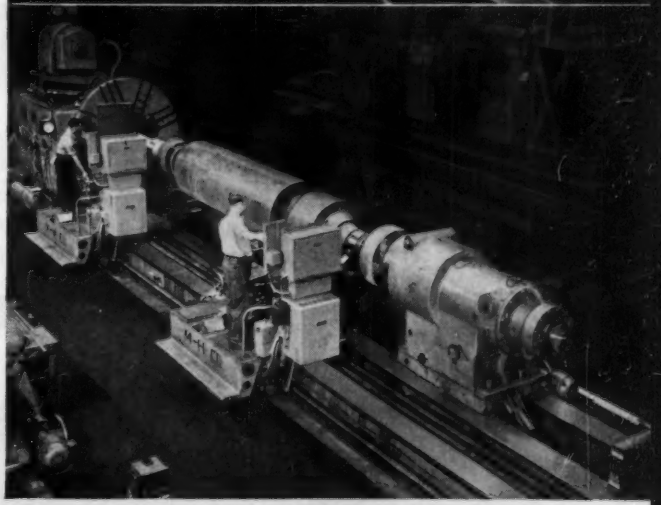
Solid answers to three heavyweight machining problems

Metal producers and heavy machinery builders owe it to themselves to check up on these Mack-Hemp developments in the field of heavy lathes.

A MORE EFFICIENT HEAVY-DUTY LATHE FOR TURNING CYLINDRICAL ROLLS. These rugged Mack-Hemp screw feed lathes are widely used in metal producing mills to finish new rolls and redress worn ones. General design is similar to that of the contour turning lathes, without the electronic tracing apparatus. Purchasers usually order these lathes with two carriages.



RAISES PRODUCTION OF 100-TON SHAFTS WITHOUT SACRIFICING TOLERANCES. Here is a Mack-Hemp engine lathe that can machine heavy steel forgings up to 60 inches in diameter and 40 feet long, holding tolerances to within 0.001-inch. Two identical carriages on each lathe speed machining of the big forgings, which weigh as much as 100 tons. Lathe shown here is one of two used by General Electric to increase production of large rotors for steam turbines and generators.



Mackintosh-Hemphill has been designing and building heavy lathes for more than half a century. We know they're good... we use them ourselves on the mill rolls we manufacture. If there's a possibility that we can help you in this field, why not get in touch with us?

MACKINTOSH-HEMPHILL
DIVISION OF
E. W. BLISS COMPANY

Makers of the rolls with the Striped Red Wabblers

Pittsburgh and Midland, Pa.

cast mill rolls • Johnston cinder pots • rotary tube straighteners • Y-type cold mills
heavy-duty lathes • steel and special alloy castings • end-thrust bearings

MACKINTOSH-HEMPHILL DIVISION · PITTSBURGH · U.S.A.

BLISS

Machines too, develop through EVOLUTION

LEES-BRADNER

Proudly announces the latest developments in the model 7 type HD *high speed production hobbing machine*

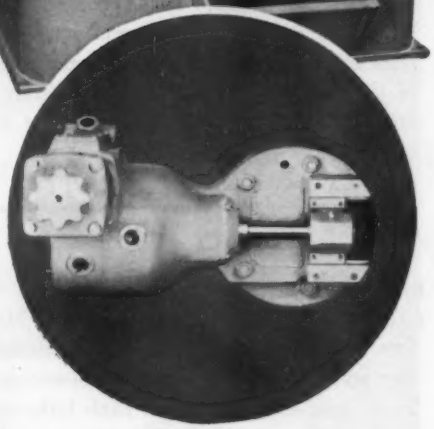
Just as given species improve, giving way to the constant press of nature, so do machines change and improve with the ever-increasing demands of industry.

The Lees-Bradner 7 HD Single Spindle Hobber is a good example. It has moved forward in engineering and design improvements to meet today's and tomorrow's production demands.

Pioneers in high speed hobbing, The Lees-Bradner Company has, through constant experimentation, created a hobbing machine far superior to its prototype. The new Model 7 Type HD Single Spindle Hobbing Machine offers industry a heavier and faster machine. Weighing approximately 1,000 lbs. more than its predecessor, it has a heavier headstock, heavier column, 10 H. P. motor and 2 H. P. rapid traverse motor.

Designed-in improvements such as these give industry savings in time and labor while meeting today's production demands . . . plus the extra capacity for tomorrow's requirements.

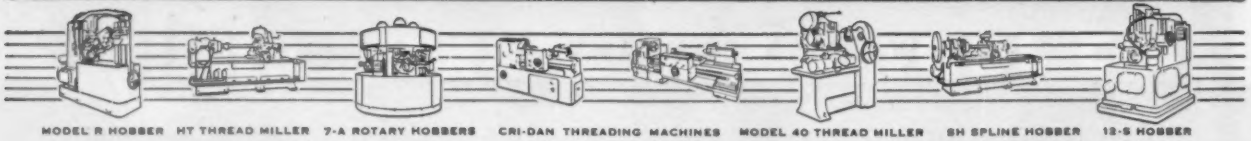
Demonstrations may be arranged on request. Contact your Lees-Bradner representative, or write us direct. No obligation, of course.



The above photographic close-up shows the new, heavier hob head with Timken bearing construction and 3-inch hob shift and new outer support.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



MODEL R HOBBER · HT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

DISSTON STAINLESS STEEL

...hot rolled to SHAPE

saves steel · tooling · machining

Stainless steel users receive many advantages by ordering Disston steel shapes accurately rolled to their specifications.

LESS MACHINING. Tool operations are simplified, for Disston shapes are rolled to precision tolerances, have exceptionally fine finishes.

REDUCTION IN WASTE MATERIAL. Preshaped Disston steel reduces scrap losses. One well-known manufacturer saved 47% of stainless steel tonnage by starting with a rolled Disston shape—instead of a rectangular section.

LOW-COST HANDLING OF SMALL ORDERS. Jobs as little as five or ten tons on a particular shape are rolled easily, economically in the Disston mills. Over 100 years of leadership in the rolling of special shapes gives Disston the edge in metal-shaping skill and technique.

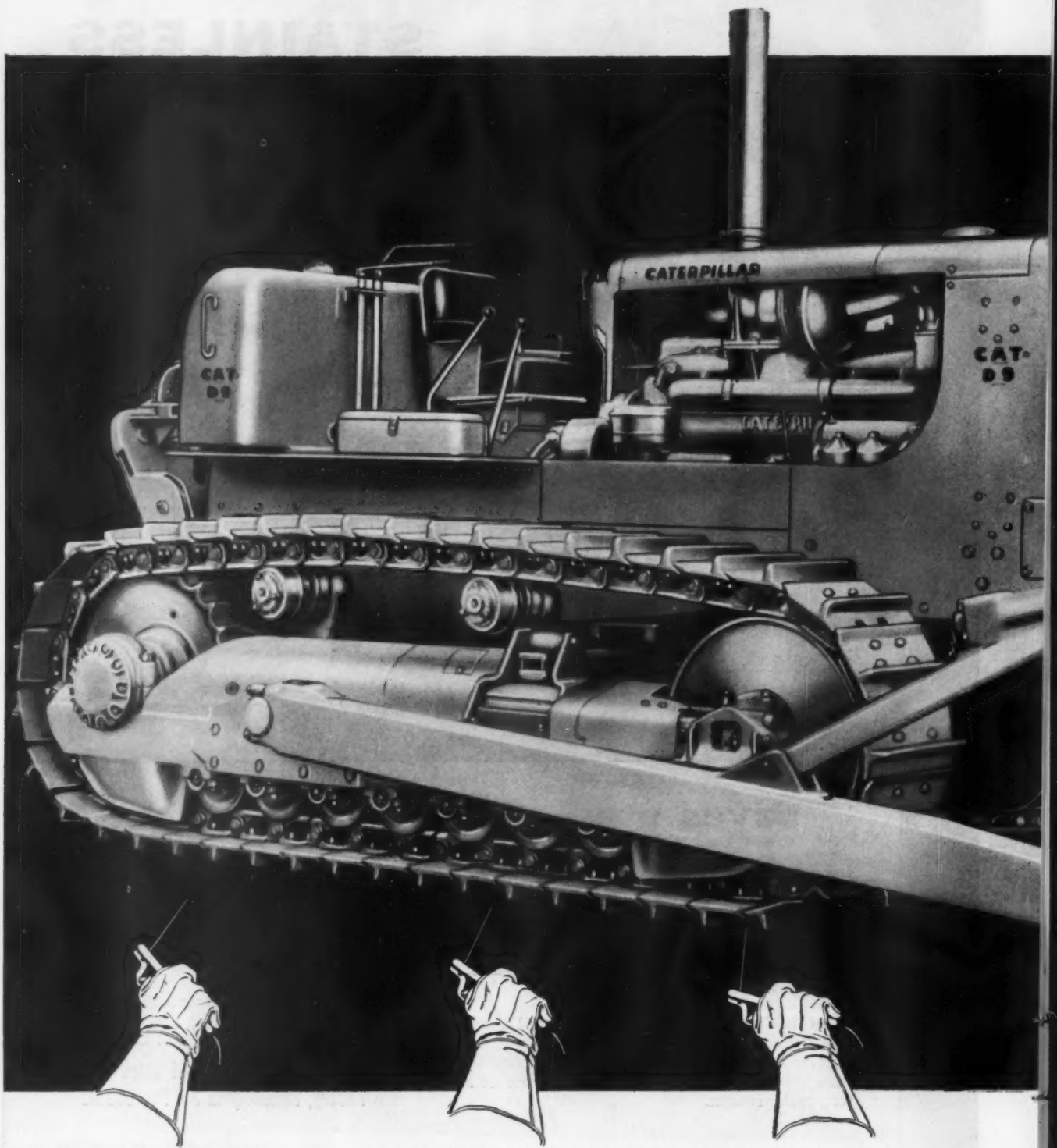
Why not talk over your requirements with a Disston representative? Learn how much you can save by using Disston stainless steel shapes. Or write to:

Henry Disston & Sons, Inc., Steel Sales Division
920 Tacony, Philadelphia 35, Pa., U.S.A.

DISSTON HAS THE EDGE®
in special purpose steels
and special steel shapes.

100 YEARS OF FINE STEEL MAKING

A. O. Smith welding



To give frame and gear box bonus strength—guts to withstand extreme punishment—Caterpillar welds with A. O. Smith's SW-35 electrodes. SW-35 (E-6020) electrodes produce 45° fillets without undercut, are ideal for downhand welding, too.

A. O. Smith SW-17 electrodes are used to complete the mighty D9's frame. These AWS Class E-6012 electrodes lend themselves to heavy production welding... possess greater built-in toughness than other electrodes in their class.

Critical parts of the D9's steering clutch case are welded with A. O. Smith SW-15 electrodes. High heat and high speed combine with stand-out performance in all positions to make these the finest universal electrodes in AWS Class E-6013.

electrodes help build world's biggest crawler tractor

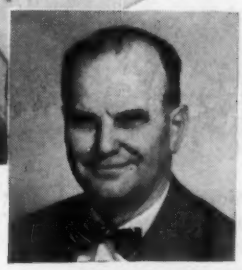
CATERPILLAR D9 TRACTOR

Built for brutal service . . . this the mightiest of all crawler tractors delivers 230 turbo-charged horsepower at the drawbar.

Reliable performance on the world's toughest projects results from Caterpillar's engineering and manufacturing skill . . . unfailing insistence on quality. The company is famous for using only the finest materials and components. For years, they have been among the largest users of A. O. Smith electrodes.

NOTE! *A. O. Smith supplies three kinds of welding electrodes for use in the manufacture of the world's biggest crawler tractor — the D9. These electrodes are favorites with the welding operators who work on the D9 line. Of course, all three electrodes were selected after thorough testing . . . after they had proved their ability to produce Caterpillar-quality welds all the time.*

If welding quality is on your mind, too, it will pay you to investigate A. O. Smith electrodes. See the representative who calls on you . . . or write A. O. Smith Corporation, Welding Products Division, Milwaukee 1, Wis.



The man from A. O. Smith . . .

Erv Steidl is the representative who helped Caterpillar select the right A. O. Smith electrodes for use on the D9. Not just a salesman — but a trained welding consultant — the man from A. O. Smith will be glad to help you with your welding problems.

PRODUCED BY WELDERS FOR WELDERS

Because welding is our full-time business, we offer you America's top line of welder-proved electrodes, machines and accessories.

Through research . . . a better way

A.O.Smith

CORPORATION

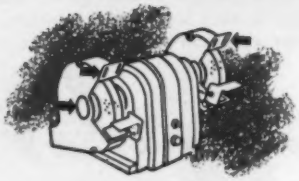
WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: MILWAUKEE 1, WIS.

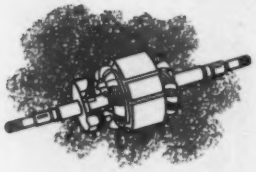
Nothing Like It For "Big Grinder"

SKIL 6"

Why SKIL Model 246 is the Finest You Can Buy:



More safety features at low price! Complete wheel guards, spark arrestors and exhaust chutes.



Fast-Starting statically and dynamically balanced motor gives vibration-free performance. Quiet, cool-running.

Self-lubrication ball bearings give continuous, trouble-free operation—save maintenance time and costs.

SKIL ACCESSORIES THAT GIVE EVEN GREATER SAFETY AND UTILITY!

Features AT LOW COST!

Model 246 Bench Grinder

FOR GRINDING, SHARPENING, BRUSHING OR BUFFING . . . IN ALL PRODUCTION AND MAINTENANCE!

Look at the advantages of this rugged, smooth-running SKIL Bench Grinder. They're usually offered only on bigger, more expensive models. Yet SKIL combines them with outstanding performance and long operating life to bring you the finest light-duty, low-cost grinder you can buy today!

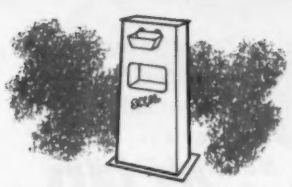
Only SKIL Model 246 Grinder offers all these important big grinder safety features at low price. Wheel guards with end covers, spark arrestors and exhaust chutes, and sturdy, adjustable tool rests. And illuminated eye shields are available as optional accessories for protection and increased visibility.

For safety, for years of dependable, trouble-free service, for all grinding, sharpening, brushing and buffing jobs in the smaller shop. Flat face design permits easier handling of work and lets you reach hard-to-get-at surfaces. Also a favorite for spotting around larger plants to eliminate bottle-necks, save man-hours. Ask your distributor to show you the SKIL Model 246 Grinder now! See for yourself why it's the biggest bench grinder value on the market!

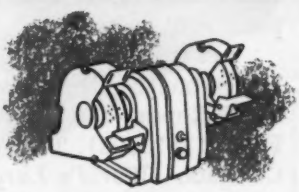
Low SKIL price—Only $58.00

⅓ h.p. 6" SKIL Model 247

Extremely powerful for its size and weight. Has all the safety features and smooth performance of Model 246. For all grinding, sharpening, buffing and wire brush work on production lines, in maintenance and repair shops and tool rooms. **Low Price—Only $68.00!**



Pedestal base for extra convenience! Storage compartment, removable water pot. Optional at small extra cost.



Solid housing of pressure die cast aluminum has maximum strength and rigidity —greater work clearance.

• Illuminated Eye Shield protects eyes, increases work visibility. *Price, $12.50 each.*

• Plain Eye Shield for extra safety! ½" shatterproof glass. *Price per pair, $7.00.*

SKIL
PORTABLE TOOLS

Made Only by SKIL Corporation formerly SKILSAW, Inc.
5033 Elston Avenue, Chicago 30, Ill.
3601 Dundas Street West, Toronto 9, Ontario
Factory Branches in ALL Leading Cities

FREE! **Mail coupon for a demonstration and FREE trial. See why SKIL Models 246 and 247 are the finest grinders of their size you can buy *anywhere* today!**

SKIL Corporation, Dept. AM-95
5033 Elston Avenue, Chicago 30, Illinois

☐ I would like a demonstration and free trial.
☐ Please send literature on SKIL Models 246 and 247 Bench Grinders.

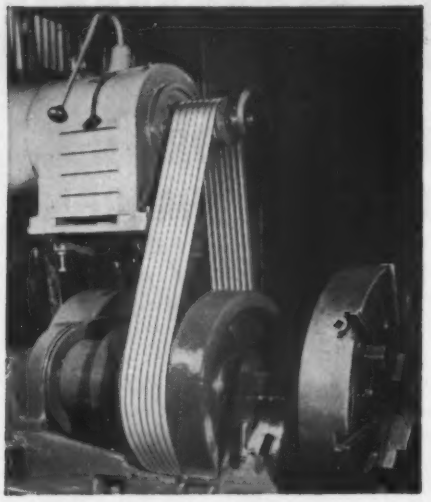
Name_____

Company_____

Street_____

City_____ Zone____ State_____

This large lathe was formerly driven by a flat belt which slipped on heavy cuts, stalled and broke tool bits. Savings on broken tool bits alone offset the cost of the drive the first year—and production was increased 25% after the V-belt drive was installed.



concave sides lengthen V-belt life ...cut costs

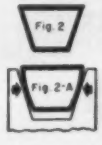
Hundreds of plants that keep track of V-belt drive costs know this: Gates Vulco Ropes . . . the V-belts with *concave sides*...wear much longer and *cost less per year of service.*

Here is the interesting reason why:

When a Gates V-belt bends around the sheave, the *precisely-engineered* concave sides (Fig. 1) fill out and become straight. Thus the sides of the belt make full, uniform contact with the pulley (Fig 1-A).

Naturally, uniform contact distributes the wear *evenly.* And *even* wear means *longer* wear.

Longer wear saves not only on replacement costs; it also saves the cost of down-time... keeps equipment producing.



Simple test proves value of concave sides

Take a straight-sided V-belt (Fig. 2) and bend it. Feel the sidewalls of the belt bulge out as the belt bends. You see immediately that the bulging sides prevent uniform contact with the pulley (Fig. 2-A). Uneven contact causes faster wear...increases your drive replacement costs.

Let the cost-saving longer life of Gates Vulco Ropes contribute to *your* profits. Specify Gates Vulco Ropes—the V-belts with concave sides (U.S. Patent 1813698). The Gates Rubber Co., Denver, Colorado—*World's Largest Maker of V-belts.*

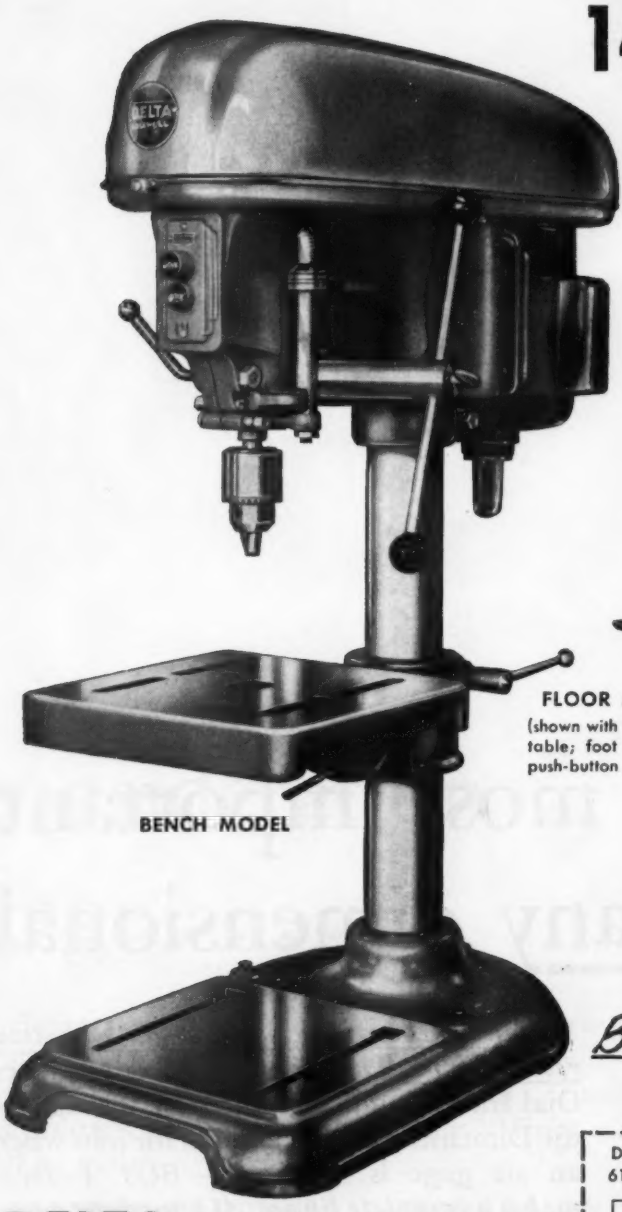
Gates Engineering Offices and Distributor Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

TPA-54A

GATES VULCO ROPE DRIVES

See Them Now...

A Completely New Line of DELTA 14" Drill Presses

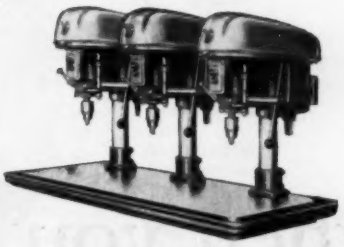


BENCH MODEL

FLOOR MODEL
(shown with production table; foot feed and push-button control)

A ten-minute demonstration will tell you more than ten thousand words about the great new DELTA 14" Drill Press line! See for yourself how eleven exciting new features increase accuracy and speed, decrease operator fatigue. See how the *low* Delta price gives you the biggest drill press value in history!

Let your Delta Dealer demonstrate the great new line of Delta 14" Drill Presses *now!* He's listed in the classified pages of your phone book under "TOOLS" or "MACHINERY."



MULTIPLE SPINDLE MODEL
(from 2 to 200 heads)

Be Sure to Send This Coupon for Full Catalog Data—

Delta Power Tool Division, Rockwell Manufacturing Company
618J North Lexington Avenue, Pittsburgh 8, Pa.

☐ Please send catalog on new Delta 14" Drill Press line.

☐ Please send name of my nearest Delta Dealer who has the new 14" Drill Press on display.

Name_____ Title_____

Company_____

Address_____

City_____ County_____ State_____

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

DELTA ROCKWELL

ROCKWELL

DELTA QUALITY COSTS NO MORE

The most important when you buy any dimensional

When a manufacturer makes only certain types of gages, he naturally recommends these for *all* applications. For instance, a manufacturer who specializes only in Dial Indicating Gages obviously cannot meet every modern gaging requirement. Neither can an Air Gage manufacturer honestly recommend his type of gage for every measuring job. Those who buy the wrong gage can't be blamed if they don't know the facts.

Where, then, can you get an unbiased recommendation? Federal not only makes Dial Indicating Gages and an Air Gage — the Dimensionair, unequalled for jobs when an air gage is required — *BUT Federal makes a complete line of ALL modern gages* including Dial Indicating Gages and Air Gages as well as combinations of various gaging and sorting systems for in-process gaging, machine control, and general automation.

consideration

gage . . . .

Before you decide what gages you need, bring your problems to Federal. Our engineers, without bias, will suggest the *best* solution . . . and may save you considerable money. Write or call us today.

FEDERAL PRODUCTS CORPORATION
Dept. 2K, Providence 1, Rhode Island

AIR-ELECTRIC GAGES

AIR GAGES
Accessories, Special
Adjustable Hole Gages
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Air Probes
Attachments
Automation
Continuous
Flatness
Grinding Gages
Multiple
Plugs
Recording
Rings
Special

AUTOMATION GAGES
Employing all gaging systems
Continuous
In-process
Machine Control
Sorting

DIAL INDICATOR GAGES
Caliper
Circumference
Comparators
Concentricity
Continuous
Curvature
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Grinding
Groove
Height
Hole
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Modified
Multiple
Snap
Special
Thousands of Designs
Squareness
Test Sets
Thickness
Thread
Widths
etc, etc.

DIAL INDICATORS
The only complete line

REGULAR TYPE
5 Sizes
66 Basic Models
(132 Different Dials)
Hundreds of Variations
9 Graduation Values
11 Ranges

SUPER-SENSITIVE
4 Sizes
8 Models
2 Graduations
2 Ranges

PERPENDICULAR INDICATORS
2 Sizes
8 Models
5 Graduations
2 Ranges

TEST INDICATORS (TESTMASTER)
Non-Magnetic
Perpendicular Type
Regular Type
1 Size
8 Models
4 Graduations
4 Ranges

DIAL INDICATOR TEST SETS
WETPROOF INDICATORS
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Automation
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Air-Electric
Dial Indicator
Electric
Electronic

Thousands of Special Designs for Thousands of Special Needs

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

WHEN PROFIT TOLERANCES ARE CLOSE

DEMAND the U.S. VERTICAL MILLING MACHINE

. . . for fast, accurate production

The U. S. Vertical Milling Machine is designed to speed work, assure precision milling. Its heavier knee and table, wider saddle and increased bearing surfaces provide the rigidity absolutely necessary for close work. Its accuracy is certified.*

New giant-sized micrometer dials are easy-to-read, simplify close tolerance milling. Three head feeds, one power and two hand, provide the needed versatility for any type cut.

Write for full specifications and detailed descriptive literature.

***Certified Accuracy—Check list showing results of actual tests accompanies each machine.**

new features

- New giant-size Dials
- Massive knee saddle and table
- Increased weight and strength

POWER HEAD

- Feed infinitely variable from .002" to .008" per revolution.
- Feed rate may be varied while in operation
- Completely enclosed hard chrome plated quill
- Coarse and fine hand feeds as well as power feed
- Quill travel – 5½"

SPECIFICATIONS:

Table size	10" x 36" or 10" x 42"
Longitudinal Feed	24" or 30"
Cross Feed	11"
Knee Travel	16½"
Dovetail Depth	1¼" x 1½"
Vertical Screw	1⅜" dia.
Weight	approx. 1 ton
Table Power Feed	0"—12" per min. (infinitely variable)

For complete information, write
THE U. S. BURKE MACHINE TOOL DIVISION
6 Brotherton Road Cincinnati 27, Ohio

THE U★S★Burke MACHINE TOOL DIVISION

The story of 5 benefits Wayne Screw Products gets from using STANICUT CUTTING OIL

Plant Foreman Al Ziegman (left) and Standard industrial lubrication specialist L. J. Loomis examine pitch diameter of screw threads. L. J. Loomis' engineering background plus his field experience in industrial lubrication, customers find, pays off for them. Lee is a graduate of Tri-State college of Indiana with a B.S. degree. Before entering field work, he completed Standard Sales Engineering School.

STANICUT Oil 137 BCS solved finish problem for Wayne Screw Products Company, gave better finish on screw and machined parts like these—plus four other important benefits.

Management at Wayne Screw Products Company, Detroit, found they were not getting a completely satisfactory finish on aircraft quality stainless steel, which the plant was machining. They followed a suggestion made by their Standard Oil lubrication specialist to switch to STANICUT Oil 137 BCS. The result: five benefits.

1. Better finish
2. Higher quality work
3. Longer tool life
4. Higher production because of less down time for tool sharpening and adjusting
5. Cutting oil costs reduced approximately 50%

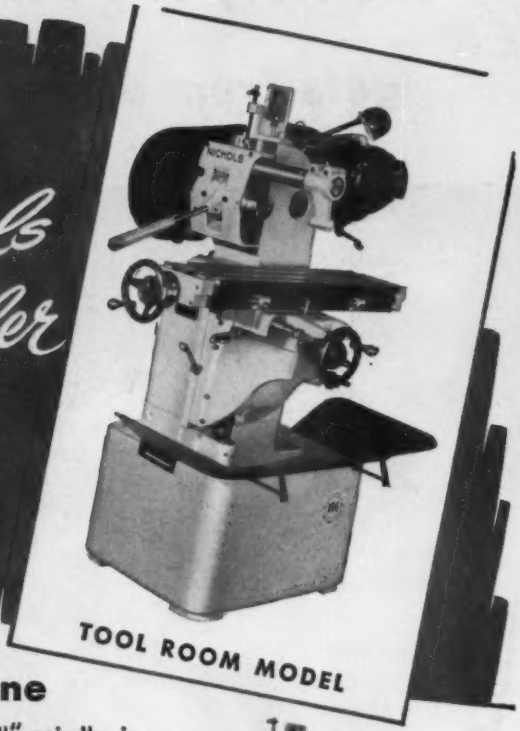
At first STANICUT Oil 137 BCS was used in two automatic screw machines—a National Acme Multi-Spindle and a Brown & Sharpe Single Spindle. Production benefits prompted Wayne Screw Products to convert other equipment to STANICUT Oil 137 BCS—and with similar results.

Delivering benefits like this is an old story for STANICUT Oil 137 BCS. A Standard Oil lubrication specialist will be happy to demonstrate how Standard's cutting oils can perform with similar results for you. In the Midwest, a call to your nearby Standard Oil office will bring a prompt response. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD

STANDARD OIL COMPANY
(Indiana)

Nichols Miller



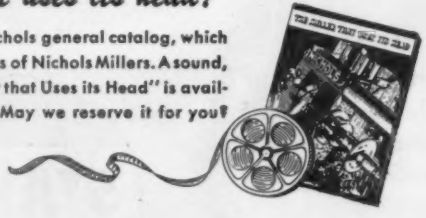
. . . a complete line

The Nichols Miller, with "rise-and-fall" spindle, is one of the most precise, universal machines available today. The four models shown, fill most basic requirements — whether for single parts with simple set-up, or multiple operations on mass production jobs with tolerances to "tenths". Their versatility makes possible such operations as facing, boring, recessing, turning, slotting, key seating and contour milling, as well as regular milling. According to requirements, screw or lever longitudinal and transverse table feeds are available optionally. "The miller that uses its head" is your best choice — and one of industry's greatest values. If you want production to "tenths", investigate the Nichols Miller.

ni

"the miller that uses its head!"

Write today for the Nichols general catalog, which describes the six models of Nichols Millers. A sound, color movie "the Miller that Uses its Head" is available for free showing. May we reserve it for you?



CONDENSED SPECIFICATIONS

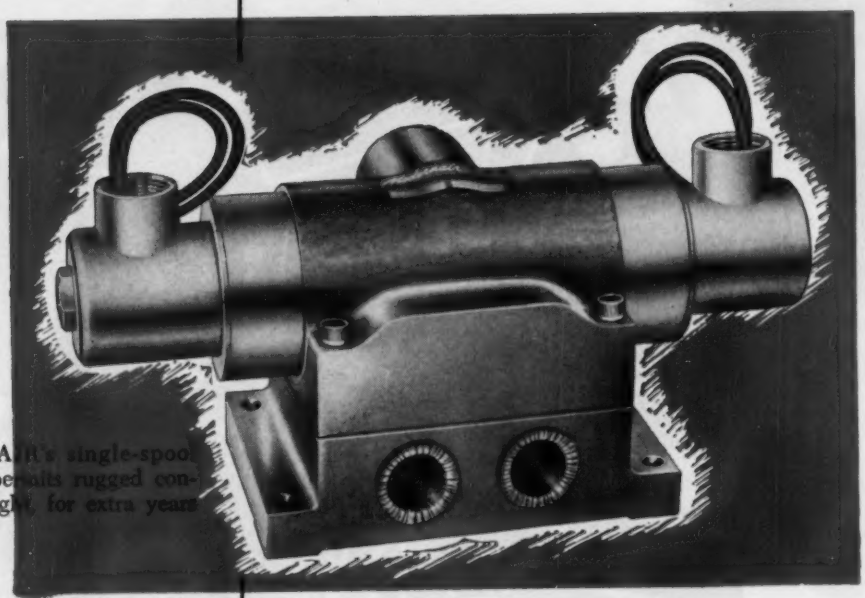
Table Working Surface	6¾" x 21" or 30"
Longitudinal Travel (screw or lever)	10" or 19"
Transverse Travel (screw or lever)	7"
Vertical Travel — Knee	13½"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to 5000 R.P.M.	
Weight	1250 lbs.

MANUFACTURED BY W. H. NICHOLS COMPANY WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS **NICHOLS-MORRIS CORPORATION**

76-F MAMARONECK AVE. WHITE PLAINS, N. Y.

Now - get these 5 money-saving benefits with *Modernair* MV Series Valves



Longer Service Life... MODERNAIR's single-spool design means fewer moving parts, permits rugged construction without excess bulk or weight, for extra years of reliable service.

Easier Maintenance... all seals are commercially available "O" rings, moving seals mounted on easily-removable sliding spool; can be replaced in a few moments with little disassembly.

Corrosion Resistant Construction... aluminum alloy body with hard drawn brass porting sleeve, aluminum alloy spool with oil-resistant synthetic rubber "O" rings.

Compactness... exclusive MODERNAIR design reduces bulk and weight, gives you maximum performance in minimum size (see photos for typical dimensions).

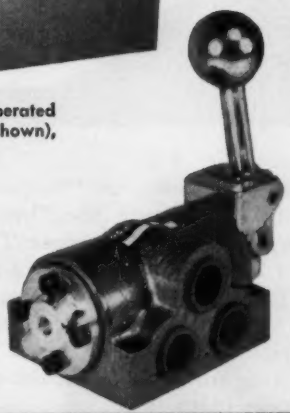
Versatility... available in ¾" through 1" port sizes for air or oil hydraulic service to 200 p.s.i., in all popular mounting styles and operating types. Basic parts completely interchangeable—reduces inventory to a minimum!

NOW READY... NEW, MODERNAIR CATALOG
Gives complete dimension data, prices on MODERNAIR's full line of cylinders, valves, packaged fluid power devices. Write today for your free copy of this handy reference book.

SOLENOID OPERATED... single or double solenoid, in sub-plate (shown), or gasket mountings. ½" port size is only 9¾" long overall; 1" port size, 13¾" long.

PILOT OPERATED... in full pilot operated or spring return types, for gasket (shown), sub-plate or standard threaded-pipe mountings. Button bleeders may be mounted in end caps if desired. Only 5" long in ½" port size, 8¾" in 1" ports.

LEVER OPERATED... also available with foot pedal or treadle, or roller cam. Standard threaded pipe mounting shown, others available.



SEE MODERNAIR'S DISPLAY Booth [illegible]—National Metal Exposition Philadelphia Convention Halls—Oct. 17 through 21.

Modernair Trademark **CORPORATION**

DEPT. A9, 400 PREDA STREET, SAN LEANDRO, CALIFORNIA

Lodge & Shipley T LATHE helps keep 'em flying LONGER

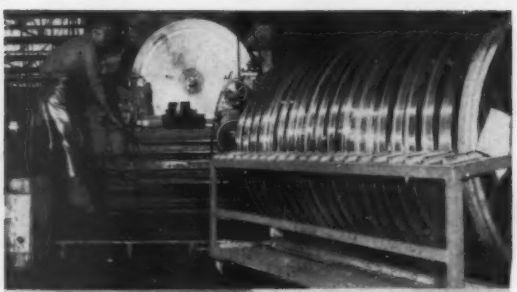
Boeing KC-97 Stratotankers refuel Air Force planes in midair. And, to give the "flying tankcars" extra range, they're now equipped with huge wing tanks designed and built by Ryan Aeronautical Company, San Diego, California.

These tanks are outstanding for light-weight, high strength, and gas-tightness. In their manufacture, a Lodge & Shipley T Lathe plays an important part, machining aluminum bolting rings which join the three sections of each tank.

The alloy rings must be machined flat on mating surfaces to within .002" as they must fit together without more than .004" spacing at any point. This rigid requirement comes from the fact that the rings must prevent fuel leakage even when subjected to extremes in altitude and temperature.

The Lodge & Shipley T Lathe was a natural choice for this job. It has cut machining time on the bolting ring, 40" in diameter and only 2" long, from 1 hour and 15 minutes to 40 minutes, a saving of 46% in time alone.

A Lodge & Shipley T Lathe requires less floor space, less capital investment and gives consistently higher production rates with outstanding precision. For details, request Bulletin 215, The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.



40" diameter aluminum alloy rings are machined to exacting limits on the Lodge & Shipley T Lathe.

Boeing KC-97 Stratotanker wing tanks keep the plane in the air longer. T Lathe-machined rings keep the tanks gas-tight.

Lodge & Shipley

. . . your **LODGE**-*ical choice!*

COLD FACTS about the HOTTEST IDEA in the history of coolants...

1. CIMCOOL° Concentrate has become, in just a few years, the largest selling chemical cutting fluid in the world.
2. CIMCOOL LOWERS COSTS because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.
3. CIMCOOL DOES A BETTER JOB because of its chemical lubricity. It permits faster speeds and increases tool life, for it combines friction reduction and cooling capacity in a degree never before attained.

We'll be happy to supply information on the many specific advantages of CIMCOOL Concentrate—or details on the entire family of CIMCOOL Cutting Fluids. Just contact us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Wire, write, or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

CIMCOOL **Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Base Additive** — For jobs requiring an oil-base cutting fluid. Added to mineral oils, it gives an economical mix for higher speeds and feeds.

CIMCOOL **Bactericide** — The most effective agent yet developed to overcome rancidity.

CIMCOOL **Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

Extra Rigidity Assures Extra Long Die Life at High Speeds

From the heavily ribbed floor plate to the high strength upper crosshead casting, Henry & Wrights are built to achieve maximum precision in punch and die alignment. Go right through the specifications of a Henry & Wright — the hand-scraped bronze bushings, the rigidly locked crankshaft connection, the solidly keyed guides in the lower crosshead, the low unit stress guide rods — and you can understand why tools function more efficiently, dies last three to four times as long and work quality goes up and stays up.

The extras you get in Henry & Wrights — and only in Henry & Wrights — provide that margin of operating safety and efficiency you want for immediate and prolonged savings in stamping costs. Step up to a Henry & Wright to be sure of peak performance.

Our catalog is yours for the asking. Please write Henry & Wright, Division of Emhart Mfg. Co., 481 Windsor St., Hartford, Connecticut.

The most efficient metal stamping method known...

HENRY & WRIGHT DIVISION OF EMHART MFG. CO. **HARTFORD, CONNECTICUT**

Cut Your Production Costs

whatever treatment you need:

- bright annealing
- case carburizing
- normalizing
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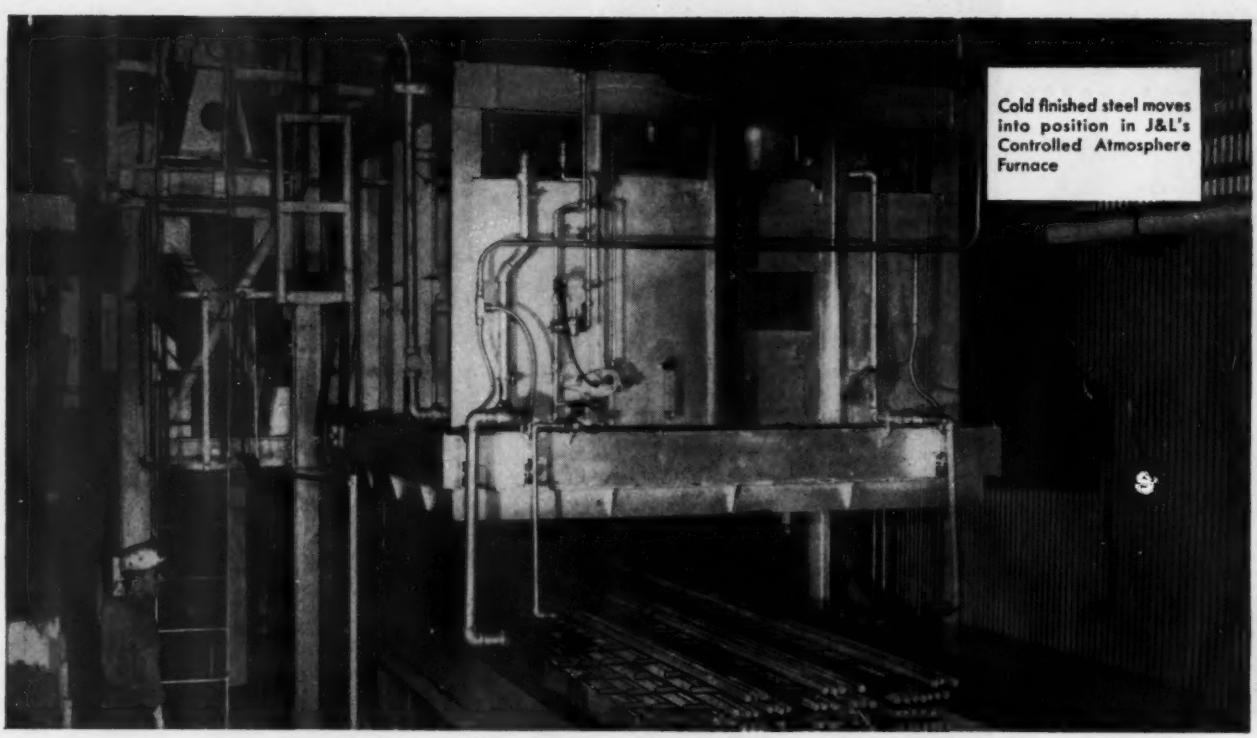
thermal treatment in prepared atmosphere furnace

saves you time
lowers over-all costs



Cold finished steel moves into position in J&L's Controlled Atmosphere Furnace

Why incur the trouble and costs of thermal treatments when J&L can do the job for you . . . quickly and economically? J&L's Controlled Atmosphere Furnace can be employed to improve the machinability or to meet the mechanical properties you need in your bar stock.

Order J&L Cold Finished Bars—thermally treated to the needs of your production line.

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Without obligation please send me your booklet "Extra Services to Users of Cold Finished Steel."

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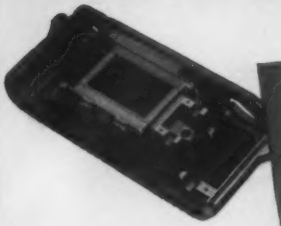
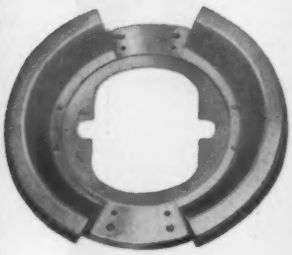
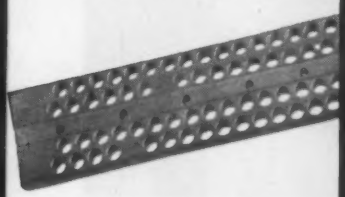


In Plastics

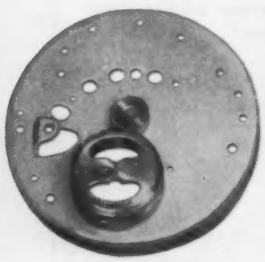
In Aluminum



In Cast Iron

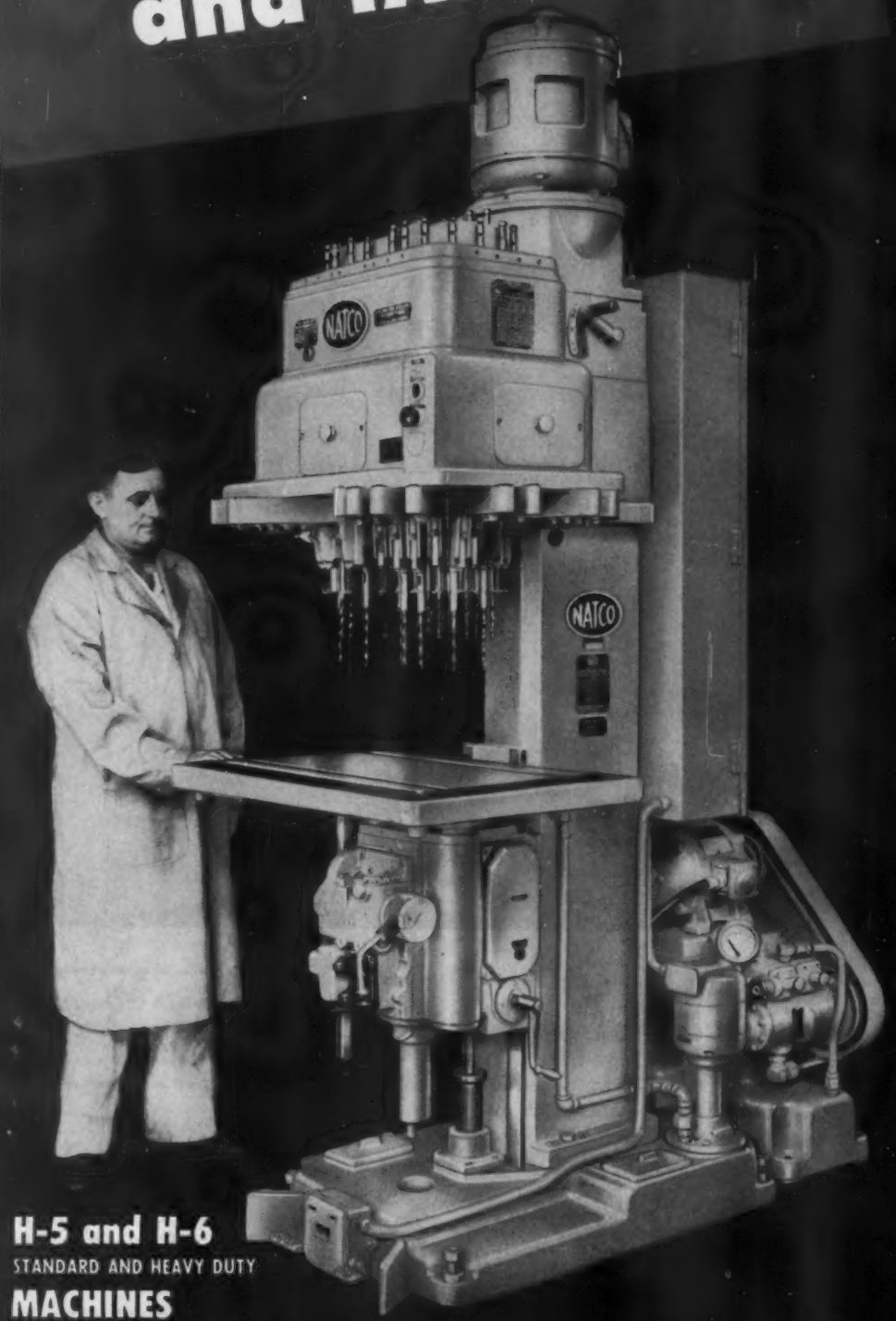


In Wood



In Steel

NATCO
HIGH SPEED, SENSITIVE
MULTI-DRILLERS and TAPPERS

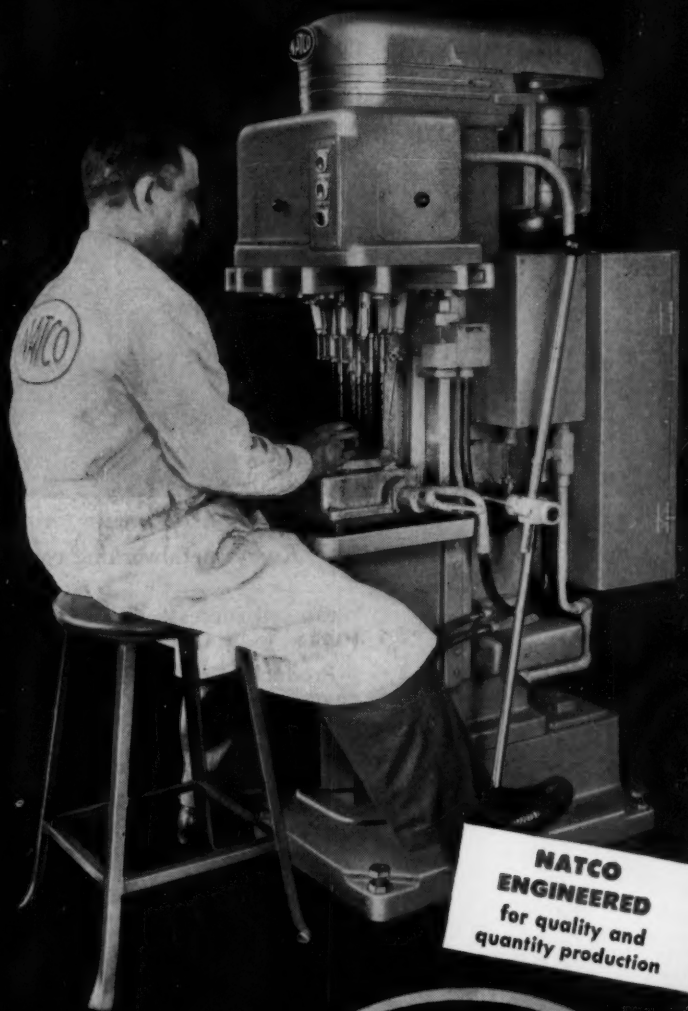


H-5 and H-6
STANDARD AND HEAVY DUTY
MACHINES
(H-6 Machine Illustrated)

...REDUCE COSTS WITH INCREASED PRODUCTION OF SMALL PARTS!

The NATCO Model B-33 light, sensitive multi-drilling and tapping machine shown at right is available in three feed arrangements: hand and foot feed or combination hand and foot and air-oil feed; and air feed. These machines have adjustable spindle arrangement for different work set-ups and a large working table. They offer maximum production on light work where super-sensitive operations and high speed are important.

NATCO H-5 and H-6 high speed sensitive multi-drillers and tappers are furnished in standard and heavy-duty models with adjustable multi-spindle, fixed center spindle or slip spindle type heads. They are provided with change gears and quick change speed mechanism for correct spindle speeds. They will efficiently handle a wide range of small and medium-sized work and make possible multiple drilling or tapping of small holes at minimum cost.



B-33
LIGHT, SENSITIVE
MACHINE

NATCO ENGINEERED for quality and quantity production

Call a Natco Field Engineer

to help you solve your problems in Drilling, Boring, Facing and Tapping

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NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

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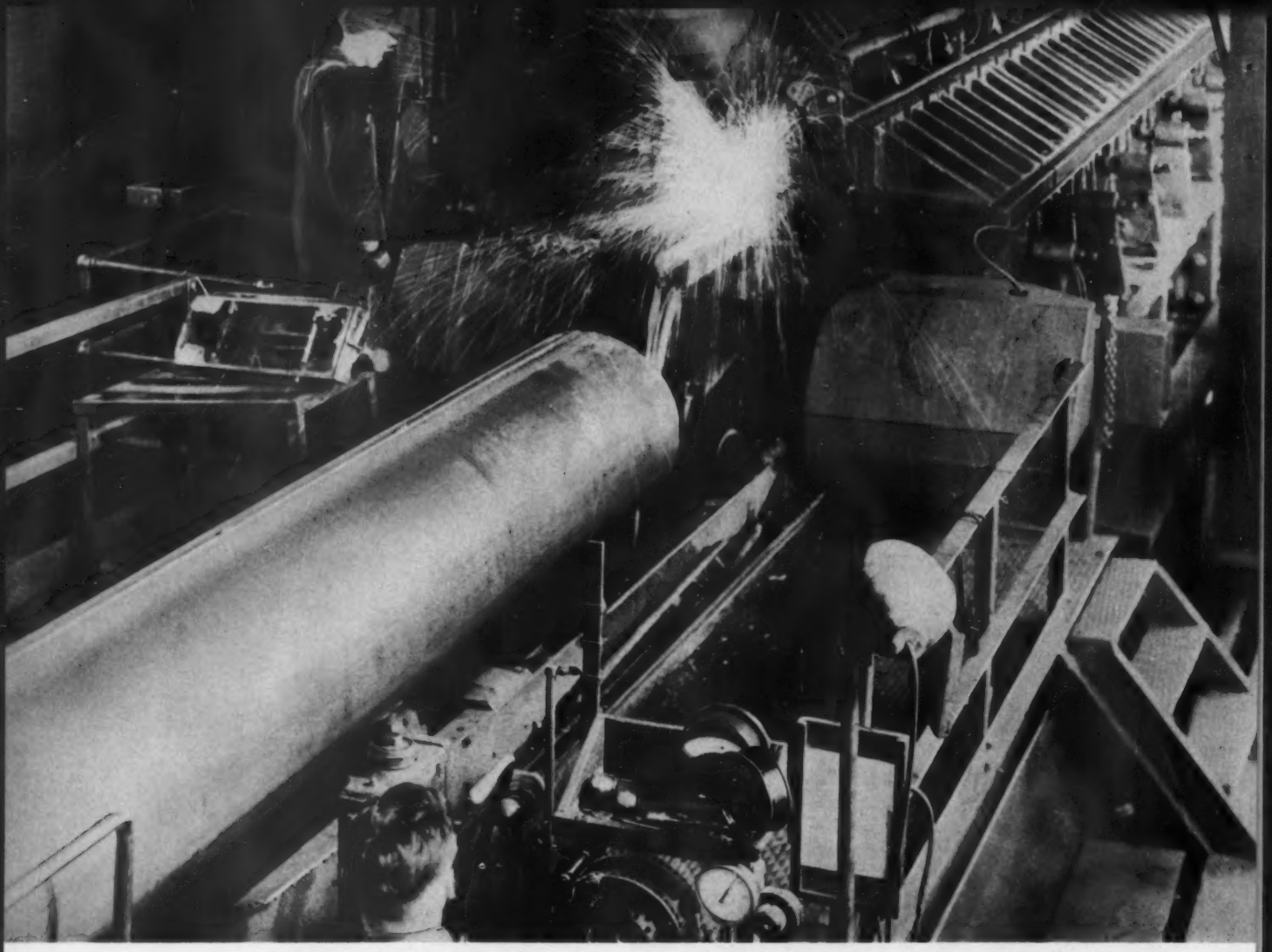

Every metalworking company is in business to manufacture products they can sell successfully . . . and the first and biggest order of business is to keep Production supplied with everything it needs.

At the A. O. Smith Corporation, for example, 94.84% of every purchase dollar is invested in the machinery, equipment, materials, and supplies used by Production.

. . . the produc~~tion~~ive way

The McGraw-Hill Magazine of Metalworking Production,
Published every other Monday

More than 200 carloads of finished products leave A. O. Smith's eleven plants every working day . . . large-diameter oil and gas line pipe, shown being welded here, automotive frames, pressure vessels, electric motors, home heating and air-conditioning systems, and many others for home, farm and industry.

"94.84% of purchases for *PRODUCTION*"

No wonder, then, that Production's engineers and executives have Metalworking's *most important buying voice.*

No wonder, either, that *American Machinist* is the most powerful advertising force in America's biggest industry. It is edited exclusively for Metalworking Production . . . gives Metalworking Production the most help . . . attracts more production-responsible subscribers than any other metalworking magazine . . . sells Metalworking Production with unmatched impact and long-sustained results.

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MAINTAIN the EFFICIENCY
of your
AUTOMATIC LATHES
and TURNING MACHINES
with the
OLIVER
20" TEMPLATE (controlled)
TOOL BIT GRINDER

The instant you equip your toolroom with an efficient Oliver, grinding time will be sharply reduced . . . production immediately expedited.

The Oliver method of single point tool sharpening utilizes a controlled and numbered template . . . grinds the complete tool in a single operation on one machine. The simple-to-operate 20" Template Tool Bit Grinding machine grinds single point tools in a fraction of the time required by other methods . . . reduces grinding time on tough tungsten-carbide work as much as 100% to 500% (using a notched wheel, with water on the wheel and through the wheel, makes this possible). Where quantities of precision-ground duplicates are required, the Oliver Way is the BEST!

Single point cutting tools machine-ground on an OLIVER TOOL BIT GRINDER provide lasting accuracy *essential* to the efficient operation of automatic lathes and turning machines. Ground on an Oliver, single point tools have a fine finish . . . meet top standards without requiring the usual second operation of diamond-grinding. An OLIVER 20" TEMPLATE TOOL BIT GRINDER is a small investment for your toolroom that is sure to pay large dividends.

We'll be glad to tell you more—just write, wire or phone.

OLIVER INSTRUMENT CO.
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Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

New Word—Old Idea

To me, "automation" is a newly created word covering a procedure that has been going on for a hundred years—namely, labor-saving methods.

Because of increased demands for certain products, coupled with the high cost of labor, there has been an acceleration in the development of labor-saving devices. In other words, automation is not a new procedure. There is just more of that, which we now call automation.

L A Dibble
Naugatuck, Conn

Bad Joke

Accompanying Mr McKenna's letter (*AM*—Aug 15 '55, p68) you had a cartoon showing a man pushing a truck, and I noticed you misspelled "tungsten" as "tungston." The letter, incidentally, was excellent and timely; it sure is time that someone brought to light the futility of excessive stockpiling by government agencies.

As the editorial in the same issue points out, we must keep ahead of Russia in industrial developments, and we can't do that without complete freedom to make maximum use of tungsten.

Richard Simpson
Chicago

Sorry you missed the point of our little joke. We titled the letter, "Tons of Tungsten," and the cartoon was supposed to show a man pushing a ton of it. Hence, Tungston.—Ed.

Any Takers?

Beg my pardon for the following request: I am a German Engineer with patent for machines and electrical engineering. In Germany I have had a workshop. For the last two years I am standing in Brazil and working in the Monark SA factory for bicycle in the position of head of department for polishing and galvanic departments. I ask for addresses of factories or magazines with advertisings of free jobs in the USA.

I am looking for branches of electrical-galvanism-constructions of motors (diesel)-parts or of places in other branches, incl big workshops etc. I am speaking english, french, german, portugese, drive cars, understand special parts (arms, munitions,; REFA, ISA, DIN, administration management etc, etc.)

I am married, have two little boys, I am 33 years old. (I was not in the

GRINETICS

By D G SMITH

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at Mason-Neilan . . . precision holes for

PRESSURE REGULATORS
CONTROL VALVES
LEVEL CONTROLS
INSTRUMENTS

QUICKLY AND ECONOMICALLY PRODUCED BY

LELAND-GIFFORD DRILLING MACHINES

At MASON-NEILAN REGULATOR CO., precision holes play a vital part in the accurate operation of a wide range of instruments made by this company to control the flow of steam, air, water, gas or oil.

To speed the flow of precision drilling operations, this well-known manufacturer chooses Leland-Gifford Multiple Spindle Drilling Machines. Multiple Spindles permit rapid handling of drilling, reaming, counterboring, spot facing and tapping operations — in any combination or sequence. Convenient centralized controls; the Leland-Gifford Indicating Shift for fast, accurate speed changes and other built-in safeguards against costly errors all combine to give the utmost in speed, precision and efficiency.

A Leland-Gifford field engineer can show you how to improve production and lower drilling costs with Leland-Gifford Drilling Machines. Phone or write the nearest office for complete information.

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3-Dimensional panto-miller

For accurate pantograph milling on all 3-dimensional work, the "Panto-Miller" 3A is a sturdy production machine. Accurately reproduces copy on flat or curved surfaces, in reduced or magnified size.

NEW:

Capacity for workpiece height.
Sensitivity of linkage.
Range of pantograph ratios.
Accuracy of reproduction.
Finger-Tip Control of spindle speeds.
Ease of operation.

The new Panto-Miller 3A is an economical answer to many standard and special production problems. Write for Bulletin PM3, which gives details and specifications.

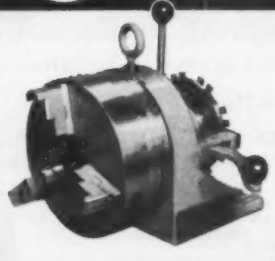
2-Dimensional panto-miller

Versatile and dependable for continuous service, the J & B "Panto-Miller" 2A:

Engraves
Profiles
Die Cuts
Mills

Investigate its advantages for your own applications. Send for Bulletin PM2

3-WAY Indexing Trunnion



Simple, Rapid, Positive positioning of workpiece or jig for all angle Drilling, Tapping, or Counterboring. Available with Chuck, Faceplate, or Right-Angle Adaptor Plate. Complete with Station Selector. For details, ask for Bulletin IT3.

J&B EST. 1870

JOHNSON & BASSETT, INC.

PRODUCTION TOOL DIVISION

WORCESTER, MASSACHUSETTS

NSDAP). That's all for me and I think that you can do a little for me for helping.

Many thanks for you in waiting for your answer.

Heinz Schwenk
Sao Paulo, Brazil
Gaixa postal 8959

Wanted

Around the year 1924, *AM* reprinted in two volumes a series of articles by Guy Hubbard entitled, "Development of Machine Tools in New England." I am very anxious to obtain a copy of this and would like to know if any of your readers has one he would care to sell.

Failing this, do you know where I might be able to get the following issues of *AM*, in which articles appeared: 1923, July 5 & 26, Aug 16 & 30, Sept 13 & 27, Oct 11 & 18, Dec 20, 1924, Jan 24 & 31, Feb 7, 14 & 21, Mar 20, April 24, June 12 & 26, July 10 & 31 Aug 14 & 21, Sept 18?

Warren G. Ogden, Jr
Winter St R.F.D.
South Lincoln, Mass

Sorry we can't help, as we don't keep back issues that long. Can any reader help Mr Ogden out?—Ed.

Not So Safe

Article No. 8881

In reference to the Practical Idea on Shop-Built Safety Switch (*AM*—Feb 14 '55, p155), we feel that we should point out that it does not comply with British safety regulations. We formerly manufactured similar types of safety devices, using a double-handed mechanical linkage, and an improved model using air-operated valves, instead of limit switches. These did not meet with approval of the Factory Inspector on the grounds that it is comparatively simple to hold a limit switch or air valve in a permanently open position by applying a weight or

wedge. And, despite the efforts of Supervision, operators will do this in an effort to earn more bonus by having one hand free.

Furthermore, while the device would eliminate accidents to the operator, if used correctly, it offers no safety to other persons attending the press, such as helpers and inspectors.

J Alan Holden
Lanarkshire, Scotland

Knowing that safety regulations are more strict in Britain than in the US, we checked with authorities there and found Mr. Holden's objections to be valid. It was also pointed out that, with the arrangement shown, it would be possible to press the treadle far enough to clear the locking bolt, release the pushbuttons, and still have time to get the hands under the die before the ram came all the way down. It *would also be possible for the operator to hold the pedal down in such a position that the lock would be held out of engagement, and there would be no safety protection at all.*

Further, in British practice, the use of springs is not considered suitable in safety protection, because they can fail, and there is an objection that the switches may "freeze" and fail to open when released.—Ed.

Cost Reducers

In an attempt to develop operator cooperation in reducing costs, I am considering launching an educational program which would publicize tool and equipment costs throughout the plant.

The idea is not new, of course, and it occurs to me that suitable publicity material in the form of posters or illustrations may be obtainable either from service organizations or from plants which have already adopted the idea. We would, of course, fill in our own costs.

We should appreciate any assistance you can give in locating some such source.

R T Scarisbrick
Methods Analyst,
Canadian General Electric Co Ltd
Guelph, Ont

American Management Ass'n advises us that suitable material may be obtained from Elliott Service Co Inc, 30 MacQuesten Pkway, Mt Vernon, NY, or from Marlin Industrial Div, Marlin Firearms Co, New Haven, Conn.—Ed.

for Special Service on Carbide "Specials"

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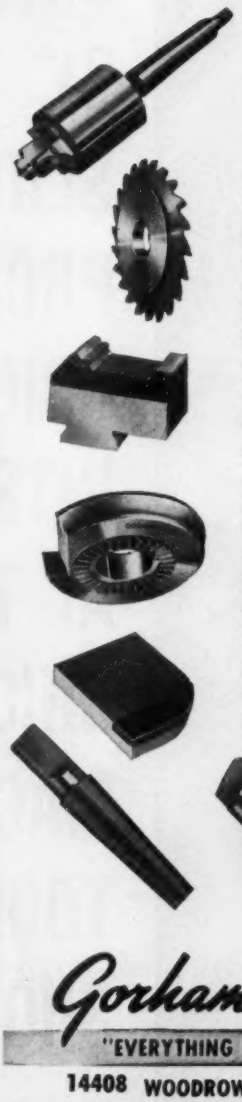
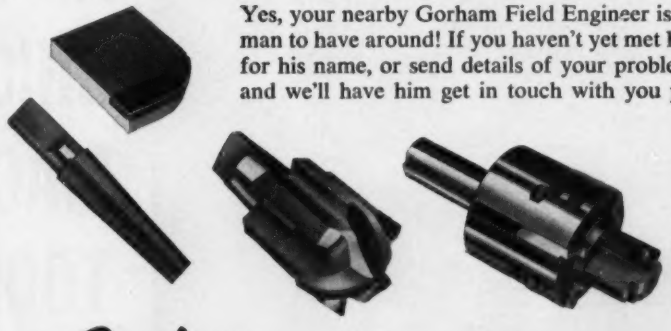


When your production machining problem dictates the use of special carbide tooling, your nearby Gorham Field Engineer can give you the right answers fast! He's an expert in the design and application of special cutting tools . . . and he provides a complete engineering service to determine your exact requirements.

He begins with your product, sketch or idea. He surveys your production operations and available equipment. He considers work material properties and required finishes and tolerances. He plots speeds, feeds and methods of tool driving. Then he develops practical design and metallurgical specifications for a special tool that's "tailor-made" for your application. And his recommendations are backed by Gorham's more than thirty years' experience in the design, manufacture and heat treatment of fine cutting tools.

Yes, your nearby Gorham Field Engineer is a helpful man to have around! If you haven't yet met him, write for his name, or send details of your problem direct, and we'll have him get in touch with you promptly.



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"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

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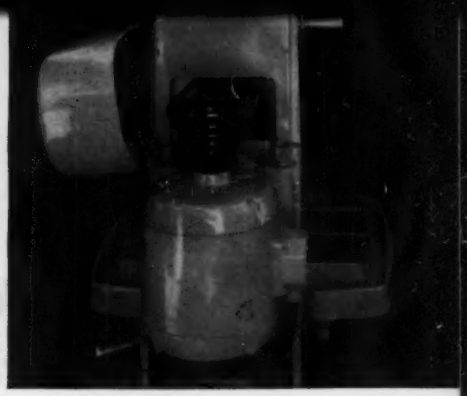
WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

NEW CINCINNATI 21" SLIDING-HEAD PRODUCTION DRILLS INTRODUCED AT THE CHICAGO MACHINE TOOL SHOW

NEW GEARED POWER FEED—The feed clutch levers engage a powerful, positive jaw clutch. Four feeds are provided—.004", .007", .010", and .015" per spindle revolution.

NEW DEPTH DIAL—This big, direct-reading dial is calibrated in 16ths of an inch. It has a positive stop for hand feed and power feed, and will disengage power feed automatically on identical operations.

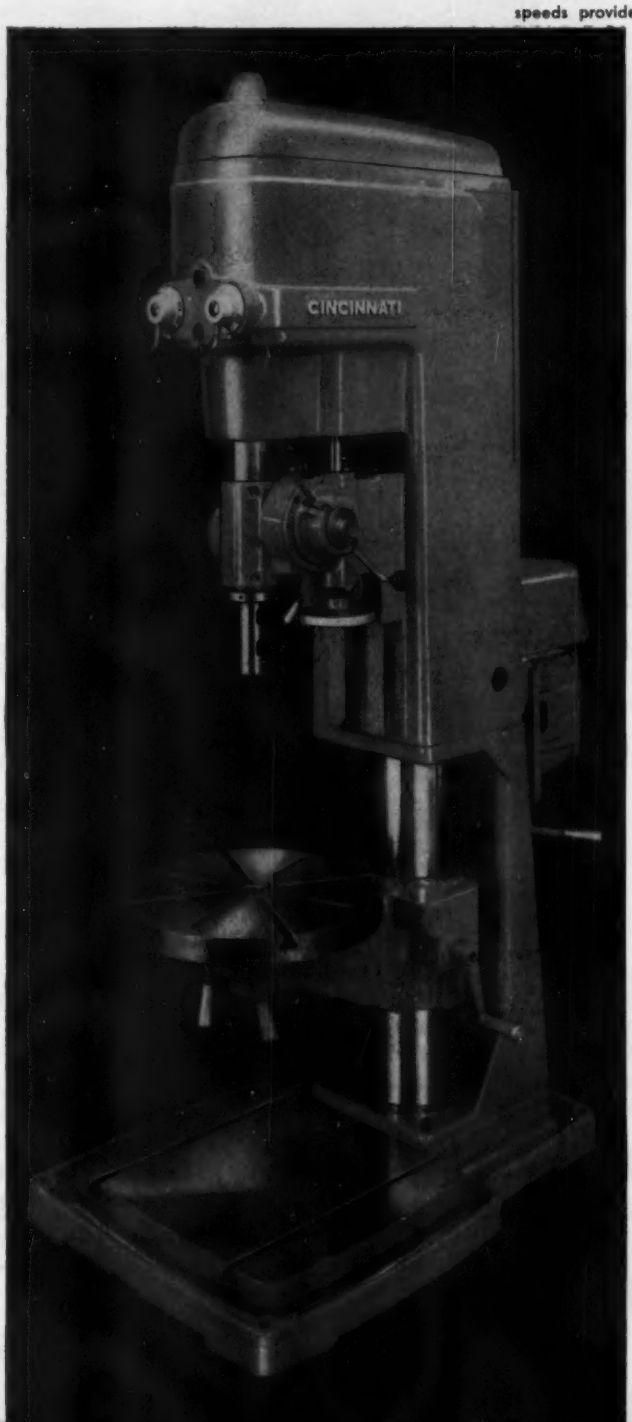


NEW EASY SPEED CHANGE—Any of 12 spindle speeds is obtained easily and quickly. Each belt position provides two speeds, low and high. To set for desired speeds, merely raise the motor cover, tilt the motor bracket with the lever provided, and reposition the V-belt on both sheaves. Then use the convenient "Hi-Lo" selector for either of the speeds provided by the belt position you choose.

Available in Round or Box Column — Multiple or Single Spindle

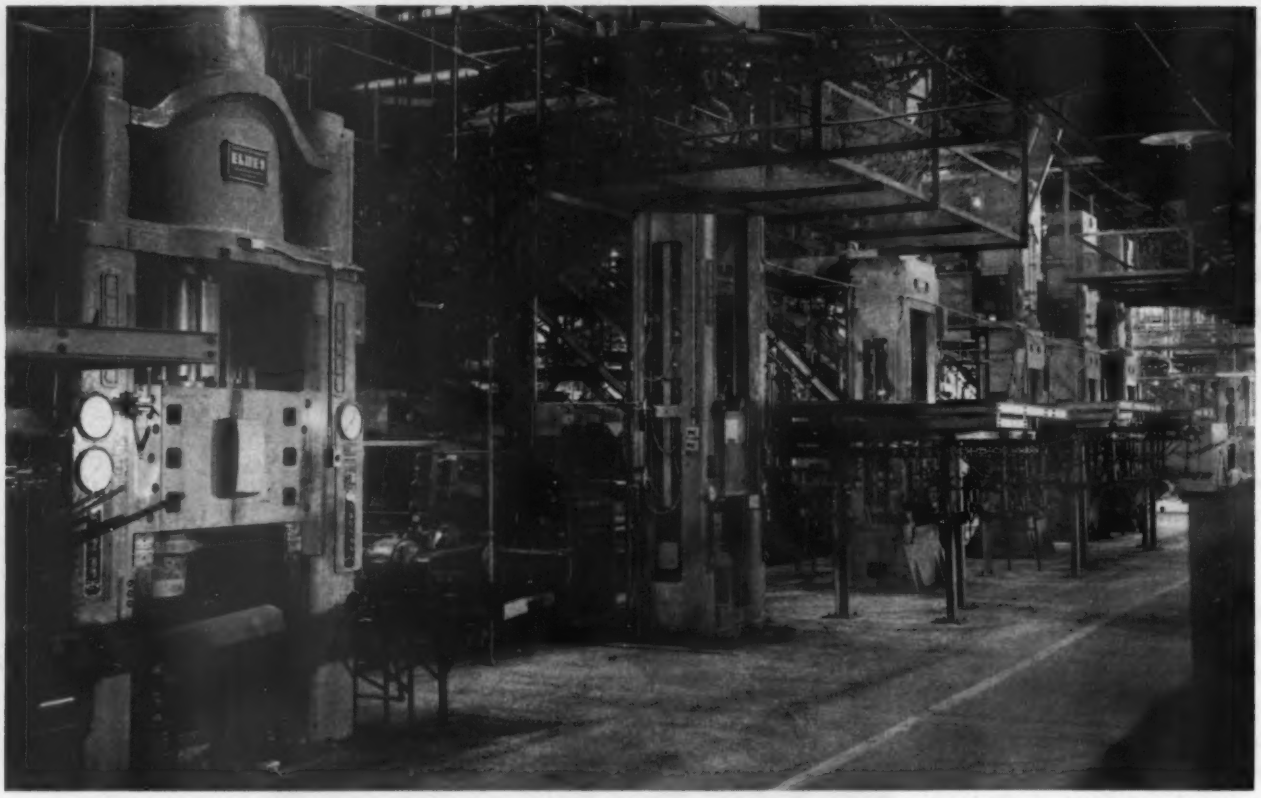
Here's a drill to meet all your production needs up to 1½" capacity in cast iron. Available in both round and box column models, and in multiple spindle arrangements up to 6 heads, this new drill performs as good as it looks. Start, stop, and reverse buttons and coolant selector switch (if ordered) are easy to reach and completely built in. A transformer is supplied on all machines operating on 220 volts or over to reduce voltage to 110 volts at the push-button station for operator safety. Any of twelve spindle speeds is obtained easily and quickly.

Write for complete catalog information and the name of your local CL&T Dealer. Cincinnati Lathe and Tool Company, 3253 Disney Ave., Cincinnati 9, Ohio.



27 ELMES PRESSES . . .

at RHEEM Manufacturing Company, Burlington, N.J. mass-produce 75 mm. cartridge cases



To meet exacting requirements for the deep drawing and forming of 75 mm. cartridge cases, the Rheem Manufacturing Company selected ELMES® Hydraulic Presses. Three similar production lines, consisting of nine Elmes Presses each, were installed. Partial view of one of these Elmes Hydraulic Press cartridge case production lines is shown. Each production line's sequence of operation is as listed below.

OPERATION	PRESS USED	OPERATION	PRESS USED
Precup	200 ton	Prehead	1500 ton
Cup	200 ton	4th Draw	60 ton
1st Draw	150 ton	Head	2500 ton
2nd Draw	125 ton	Taper	75 ton
3rd Draw	75 ton		

Each of the Elmes Presses is equipped with full electrical pushbutton controls. On the draw presses, operating speeds are as high as 2200 ipm on advance and return, with pressing speeds as high as 780 ipm. Strokes vary from 30″ to 84″. This important installation is additional evidence of the high regard the metalworking industry holds for Elmes Press performance. Let Elmes assist *you* in selection of the *right* press for your production. Recommendations and cost estimates are yours for the asking.

ELMES

AMERICAN STEEL FOUNDRIES • ELMES ENGINEERING DIVISION
1161 Tennessee Avenue...Cincinnati 29, Ohio

HYDRAULIC PRESSES & EQUIPMENT

METAL-WORKING PRESSES • PLASTICS MOLDING PRESSES • PUMPS • ACCUMULATORS

Spot News of Metalworking . . .

- **Flooded plants as trade-ins on new, custom-built modern plants** anywhere in New England, is the newspaper-ad offer of Grossman Industrial Properties, Quincy, Mass, "backed by every Chamber of Commerce in New England." It's New England's answer to "move down South" offers.

- **Some 10,000 small metalworking firms need $100 million to keep going.** That's the estimate of one of the country's biggest commercial financing firms. The companies, mostly too new to have much of a production history, can't get bank loans for capital goods to enable them to fulfill government and civilian contracts. The alternatives: mergers or commercial financing.

- **Defense producers will get a chance to talk shop with the military** in a new series of Defense Dept-industry field conferences. First will be held in San Francisco October 5-6, the second in Los Angeles October 10-11.

Are we entering the era of "chipless production"? William C Newberg, president of Chrysler's Dodge Division told the recent AMTDA meeting (see p188) it isn't far off. Precision forging, casting and cold-drawing methods are improving so fast, he said, that "in a few years we may look back on our present method of machining castings and forgings as a somewhat quaint and old-fashioned way of doing things."

- **Titanium alloy extrusions on a production basis** are being fabricated at Harvey Aluminum, Torrance Calif, in 10-12 ft lengths from 4A1-4Mn, 3A1-5Cr, 3% Mn complex, 6A1-4V, and 5A1-2.5Sn.

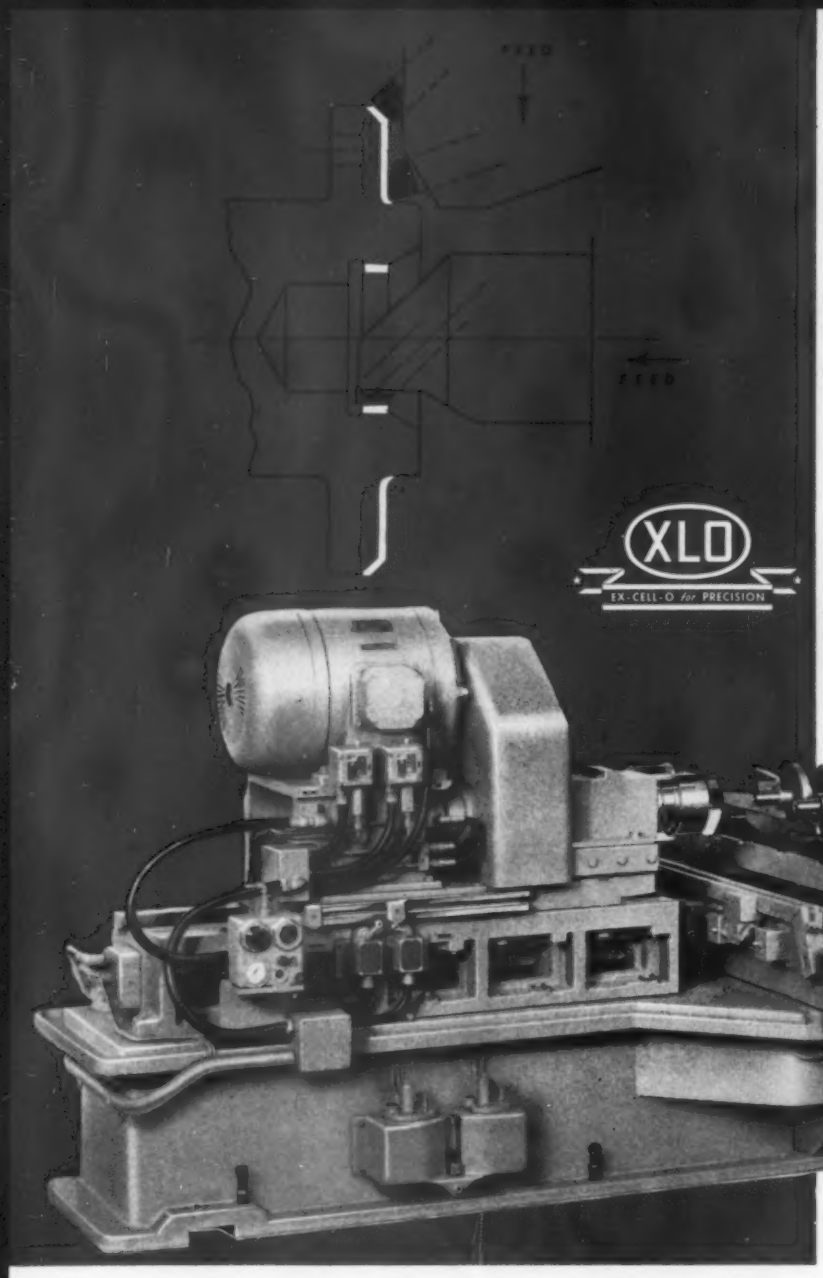
- **Solid molybdenum ingots that can be worked with conventional equipment** are being "arc-cast" by Climax Molybdenum. This permits larger ingots and avoids previous compressing and sintering of powdered metal. Moly melts at 4730 F, almost 2000 F higher than iron, has a useful strength greater than that of any other known material at temperatures over 1600 F.

- **Chrysler is getting stamping runs of 20,000 with plastic dies** on Crown Imperial body stampings, plans to replace more and more steel dies with them because they take only a third as long to make, are cheaper.

When members of Mechanics Educational Society of America recently struck Eaton Mfg Co's Axle Division, they let foremen through the picket lines. Once inside, with nothing much to do, the foremen got bored. So the company set up 22-man classes on basic economics. The idea was so popular that Eaton will continue classes as a regular thing in all its plants.

- **Mercury officials predict sale of 6.5 to 7 million cars in 1956,** are tooling up to produce 600,000 cars in '56 and 700,000 in '57. Plymouth, too, is aiming for a high market, with 3000-engines-a-day output at its new plant.

- **Government's titanium dilemma:** on one hand ODM is canceling the U S aid to titanium production program because "output is already far ahead of defense needs." On the other, the Defense Dept has just launched a multi-million dollar titanium sheet rolling research program.



On this Ex-Cell-O special Machine two standard, hydraulically operated slides are mounted on a base with a transfer type fixture between them. The left slide, which supports the spindles, advances, and hydraulically operated chucks grip and rotate the parts. Then the right slide carrying the tools advances. Crankshaft operations include precision boring a diameter within limits of ±.0005″, holding the bore concentric with main bearings, facing a surface square with main bearings, and chamfering an edge. Surface cuts are indicated in white in diagram at left.

EX-CELL-O Special Machine Bores, Faces 2 Crankshafts SIMULTANEOUSLY

What an improvement!

Automation equipment picks up *two* automotive crankshafts, places them in machining position, bores, faces and chamfers the flange ends simultaneously, and transfers them to the unloading position *all in one automatic cycle.*

Building special purpose machines is an Ex-Cell-O forte. Manufacturers with problems in accuracy, production, and in combining numerous operations, look to Ex-Cell-O.

In return for this confidence Ex-Cell-O builds them special machines which quickly pay for themselves through substantial production increases, improved quality, and reduced unit costs.

Whatever your plans for greater, more economical production, they can be materialized at Ex-Cell-O. Your Ex-Cell-O representative will be happy to discuss them with you.

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AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington . . .

Study foreign bids on turbine tools . . .

Should foreign bids be allowed on the $66 million worth of machine tools to be bought by GSA for creation of standby steam turbine capacity? That's the question now under study by an interagency government committee headed by ODM Director Arthur Flemming. Only last month, Flemming directed GSA to buy the equipment.

The committee includes representatives of GSA, SBA, and the Commerce, State, and Interior Departments.

The study comes on the heels of recent protests by (1) U S machine tool makers over awards of some Air Force tool orders to European producers, and (2) an English firm over an Army award of heavy electrical equipment orders to higher-bidding U S companies. The latter case was as an exemption from recently liberalized "Buy American" rules.

The study fits into a Commerce Dept-State Dept controversy over the general matter of foreign bids on U S government procurement. Commerce urges a selective ban on such bids in advance. State generally opposes a ban on foreign bids, says that if a ban is made it should be only in limited cases where national security is an issue. The machine tool study may well set up a precedent on future government procurement under "Buy American."

Plant and equipment spending . . .

Latest SEC-Commerce Dept estimates show that industry plans to spend $27.9 billion this year on new plant and equipment. That's 3% more than was scheduled at the start of the year. If expenditures for the last half of 1955 shape up as now estimated, the year's outlays will be 4% over last year's figures, only 1% below the all-time high of $28.3 billion in 1953.

There's a $4 billion spending increase from the seasonally adjusted annual rate in the first quarter to the fourth quarter. About half the hike comes from manufacturing, mainly capital goods industries. Biggest increases are chalked up in iron, steel, and machinery making.

Metal stockpiling tapering off . . .

Outlook for new government stockpiling is up in the air. Future acquisitions depend pretty much on the politics of balancing the budget and the general demand for raw materials by industry. But what ever direction the stockpile takes from here on out, its influence on metal markets will continue—as a prop for prices when the government buys, and as a lid when Washington releases civilian metal.

Right now, the stockpilers are playing their game close to the vest. With some rare exceptions, they've made no new purchase commitments for over a year, and have no firm deliveries scheduled after June 30, 1956. In addition, no purchase program has been set up yet for fiscal 1957. The strategic stockpile books now show only $322 million still unobligated and $445.2 million in unliquidated obligations.

Under original plans, all the 75 goals were to be met by 1960, most of them within two years from now.

As things stand, about half are now filled and only three—nickel, high-grade mica, and selenium—are less than one-quarter completed.

The administration's recent budget review reported that stockpile spending in fiscal 1956 would total $700 million.

That's $83 million below the spending estimate made last January and $102 million less than was spent in fiscal 1955. Chances are fiscal 1957 stockpile buying of metals will be at an even smaller rate.

Anti-trust curbs on foreign investment . . .

Liberalization of the anti-trust laws as a spur to new foreign investment is being talked up. Latest straw in the wind is the Senate Antitrust and Monopoly Subcommittee's probe into the Sherman Act's effect on foreign investment by U S firms.

If impediments to investment stemming from anti-trust can be pinned down, the subcommittee plans to develop legislative recommendations for liberalizing the law's application to foreign operations.

But it's unlikely that much will come out of the present investigation. Weakening anti-trust laws in an election year is not good politics. Commerce Dept has tried to get Justice Dept to give advance rulings of the legality of foreign investment deals and to limit penalties in border-line cases. Beyond this, there has been some pressure from the investment community for complete immunity from anti-trust laws. The anti-trusters charge that such tactics hide a flank attack on anti-trust enforcement.

But as more and more companies seek investment opportunities overseas, the subject becomes more significant. Controversy over the application of anti-trust to foreign operations centers around the problems of the American firm which seeks to export its technological knowhow at a profit, gets involved in restrictive international agreements to fix prices, restrict production, allocate markets, and so forth.

The Sherman Act forbids "every contract, combination in the form of trust or otherwise, or conspiracy in restraint of trade or commerce among the several states, or with foreign nations." The courts generally have limited action under this provision to "unreasonable" restraints.

But remember this: any agreement among real or potential competitors to share markets almost always has been found to be "unreasonable" on the face of it. The word "contract" in the law often has been extended to mean an exclusive sales distributorship in a foreign country. But an agreement is not illegal under the law unless it restrains—directly or indirectly—U S foreign commerce.

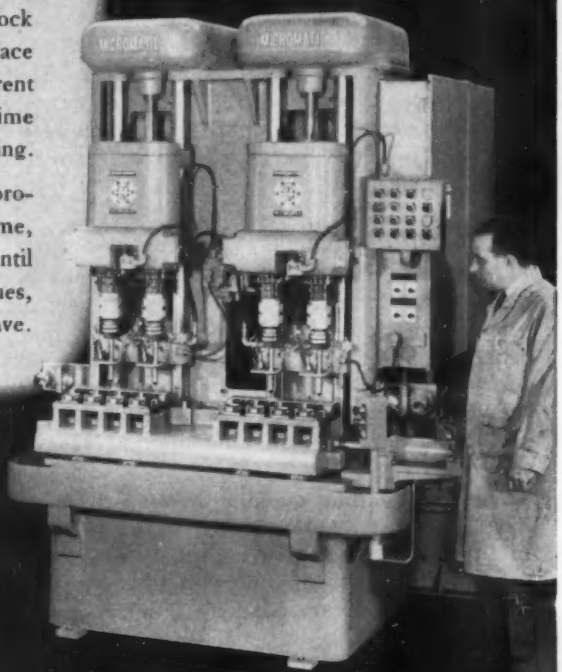
The man who needs a new machine tool and doesn't buy it is paying for it anyway...

in lost production

Because costs are set largely in labor and burden, lost production is reflected directly in high unit cost. Old equipment is not the only cause. Failure to utilize the latest processing techniques may be keeping you from increasing production and lowering unit cost.

For example, consider the low-velocity, controlled-abrading Microhoning process which combines stock removal, geometric accuracy, size control and surface finish to increase *production* and *precision*. Inherent characteristics of Microhoning eliminate such downtime factors as tool sharpening, fixture and machine aligning.

The difference between your current output and the production possible with Microhoning will, in a short time, cover the cost of new Microhoning equipment. And until you do utilize the most efficient processing techniques, you are paying for new machine tools you don't have.



PART:
Connecting rod—wristpin and crankpin bores.

PROBLEM:
High unit cost; how to increase production without increasing labor or burden cost.

SOLUTION:
Microhoning—simplified processing of wristpin bore (eliminating 3 operations); gross production increased to 600 bores per hour, within all specified tolerances.

*MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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Hydraulic Controls • Diesel fuel injection equipment

Autodom's capital goods buying spree . . .

was very much in evidence at the Machine Tool Show, where many of the newest developments were tailor-made for the automotive industry.

In booth after booth, you could spot top auto production men huddled over blueprints with machine tool builders. One builder showed AM reporters models of machines created only the week before the opening of the show.

In another booth, two engineers from a top auto firm were talking turkey on purchase of a $500,000 drilling line. This was no isolated instance, autodom was in a buying mood at the show, and the builders were ready for it with an unprecedented array of revolutionary new concepts.

Here is an example: one grinder manufacturer had a model of an 8-station crankshaft-grinding setup. On order by two makers, only one unit has been built. The first line will affect '56 models at mid-year, the second, '57 models. The line illustrates the recent trend in transfer machines: all the grinders are standard and interchangeable, with extensive banks between machines. A spare machine is available to take over any operation if one of the 8 machines in the line breaks down.

10-million cars a year . . .

is the ultimate goal of the auto industry—and it may not be so many years away. The race for the lion's share of those 10 million cars a year is neck and neck between Ford and GM, with Chrysler cutting down the lead. The Little Three are in there pitching, too.

It all adds up to the biggest expansion in automotive history coming up in the next few years—and unprecedented markets for capital goods.

Chrysler, for instance, in an off-beat year spent $175 million retooling for its '56 models.

And it spent $130 million for new plants and engineering facilities so far this year. Chrysler is also rumored to have another giant new engine plant on the boards.

Cadillac and Buick have announced they're going to make trade-in rear ends. This packaged rear end, the first in auto history, is indicative of the new trends that will require new tools.

Ford's new Mahwah, N J, assembly plant . . .

is an auto builder's dream-come-true. The sprawling, one-story plant has an L-shaped assembly line with frames and chassis units assembled on the short leg, and final assembly on the long leg. Feeding into the assembly line are the lines on which bodies are welded together, painted and trimmed; and on which front ends, cushions and other units are assembled.

Looking like a cross between an auto plant and aircraft plant, the new building introduces distances so great that workers have to use bicycles and gas buggies to get around.

The Mahwah plant has lifted materials-handling principles from Ford's Cleveland engine plant—automatic transfer units that feed bodies from one section to the next in a body-assembly line that zigzags back and forth through the heart of the plant. At frequent intervals along the line, bodies requiring rework can be switched to subsidiary lines.

The Mahwah plant is geared to assemble 400 cars a day on a one-shift basis.

'56 autos stress safety . . .

The keynote of '56 Fords is safety — with safety belts and crash pads for the dashboard available on all models at no extra cost. Doorlocks have been redesigned so kids can't open them. And they're more resistant to collisions.

Basic idea of the Ford safety campaign is to stop or minimize effects of the "second accident." The "first accident" occurs when the vehicle crashes into another car or barrier, the second happens when passengers are thrown around inside the car.

Ford hopes to minimize the second accident by installing as a standard item on all makes a safety door lock (research has shown that when doors are burst open in an accident 26% of the occupants are thrown out of the car and their injuries doubled).

The new safety lock will prevent the door post or column from weaving out of contact with the door. Also designed to cut down second accidents: a shatterproof, rounded rear-view mirror that minimizes cuts from sharp corners, flying glass.

The standard steering wheel collapses in a crash —instead of the driver's rib cage. Chrysler is stressing safety this year, too.

Ford, incidentally, kicked off what it hopes will become an Annual Safety Forum this month.

Nearly 100 safety experts and engineers attended the two-day forum at Dearborn, where they talked over results of two years of intensive safety study, watched cars with lifelike dummy occupants crash.

Interesting, for the strong-of-stomach, were color films showing Ford research at Wayne University Medical School, where the severed heads of cadavers were dropped down an elevator shaft onto instruments panels to simulate the effects of head-on crashes on human heads.

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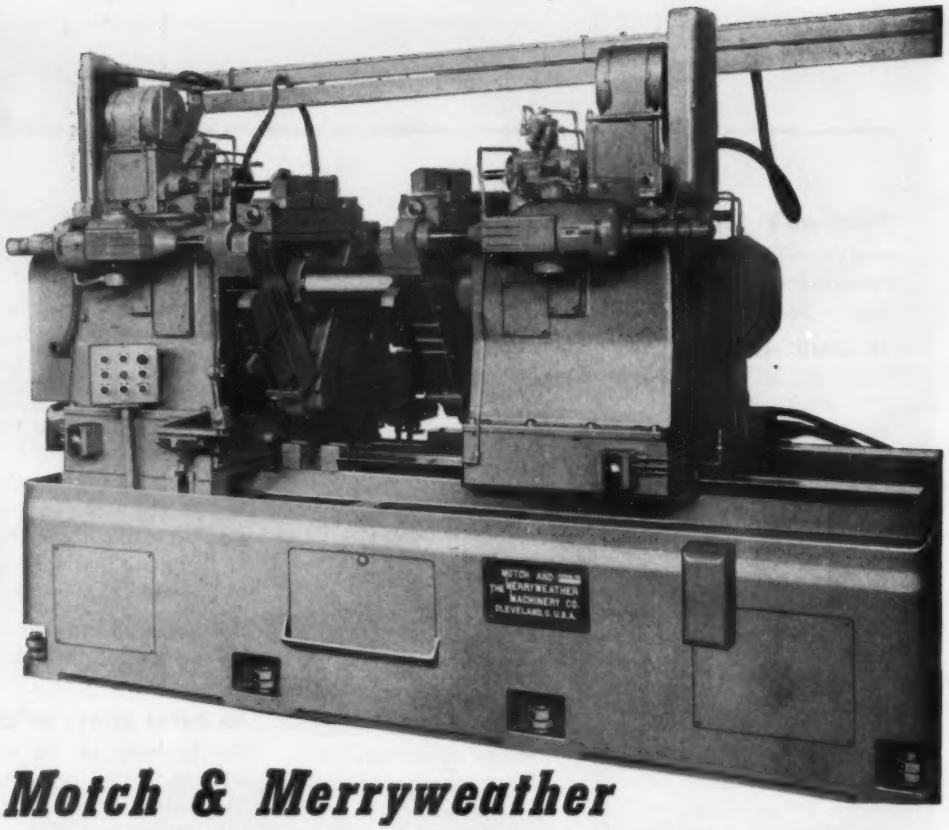

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No. 3-MCT Milling and Centering Machine
FOR UNIVERSAL PRODUCTION

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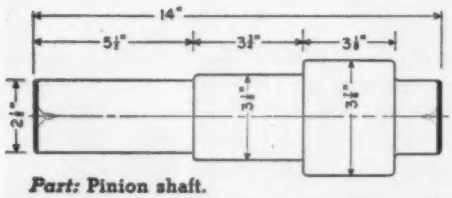

Part: Pinion shaft.
Operation: Mill and center drill both ends.
Production: 220 pieces per hour.

Mass production, yet with extreme accuracy, — that is the central requirement for preparing parts which go to your automatic equipment. Begin automation *right* by preparing your parts *right* on the Motch & Merryweather 3-MCT Milling and Centering Machine. This universal heavy duty unit excels for high single-purpose production, while quick set-up makes short runs profitable. Automatic loading and unloading may be incorporated to handle extremely high production. The 3-MCT performs with a dispatch and precision hitherto unknown.

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MACHINERY MANUFACTURING DIVISION
CLEVELAND 13, OHIO

Machine Tools . . .

Chicago Show huge success . . .

The Machine Tool Show at the International Amphitheatre in Chicago came up to the expectations of its most ardent enthusiasts.

Attendance exceeded that at the 1947 show by a wide margin. The goal of 100,000 registrants was actually reached.

Big machine tool users were much in evidence. D S Harder and D J Davis of Ford made a detailed inspection of the Show. Ralph Cordiner, General Electric president, toured the Show one afternoon. These three men were typical of the large numbers of top executives who came to see for themselves what is new.

Visitors were in a buying mood. Many sizable deals were initiated, with the anticipation that they would be closed soon after the Show.

Small shops buying equipment . . .

Small shop operators were ready to spend money too. One example: General manager of a Michigan company looked over the new machines at the Show and returned home intending to spend $30,000 immediately on new tools. His outlay was equal to $1000 per man.

One machine tool builder added up a total of 20 machines that were as good as in the order bag, stemming from show visitors.

It is doubtful whether any industrial show has run more smoothly, from opening day until the final hour, than the Machine Tool Show.

For this extraordinary performance, thanks are due Tell Berna, NMTBA general manager; William Rutz, chairman NMTBA show committee and his committee members; Mrs Frida Selbert, NMTBA secretary; and Clapp & Poliak Inc, professional show managers.

The Show was blessed with pleasantly cool and dry weather, with the exception of two or three warm days.

Machine tool sales outlook is bright . . .

The short-range weather prediction for machine tool sales is: Sunny, with comfortable temperatures.

It is hard to find a machine tool man who does not feel that business ahead is bound to be very good.

It is no secret that many builders underestimated their 1955 production schedules, which originally were based on the outlook as viewed late in 1954.

Those schedules have been revised upward onto a more realistic level. Hence shipments the latter half of this year should be better than in the first half.

There is to be no major letdown in automotive buying of machine tools. The important motor car makers will make vast outlays for machine tools before the end of the year and throughout 1956.

Tractor and farm implement makers, like Caterpillar, are known to have important tooling expenditures in the offing.

Tax rules for leasing set up . . .

All companies that have leased machine tools or plan to do so should have a keen interest in Internal Revenue ruling No 55-540. Here, for the first time, the income tax people have published a guide for determining whether agreements for payment and use of machine tools, other than outright sales, are leases or conditional sales. Detailed story is on p191.

Inquiry reveals that leases constitute about 10% of the total sales of one machine tool builder prominently identified with leasing. In the case of another builder with a leasing program, leasing agreements this year have run about 6% of sales, compared with 10% during 1954.

Rumors of mergers heard at Show . . .

The Machine Tool Show was a breeding ground for rumors about mergers of machine tool companies.

Investigation showed that most of the rumors were without substance. Nevertheless, some mergers obviously are in the formative stage.

One well-known promoter of a "General Motors idea" for the machine tool industry sent letters a few weeks ago to a number of machine tool builders suggesting that he would be interested in buying them.

Giddings & Lewis' acquisition of Cincinnati Bickford, as well as Cincinnati Milling's purchase of Heald, stimulated much of the rumor talk. Another stimulant was the public admission by Leopold Silberstein, Penn-Texas president, that he is interested in adding another machine tool company to the Penn-Texas empire, which now includes Pratt & Whitney and its subsidiary, Potter & Johnston.

An eastern machine tool builder is known to be negotiating for purchase of a cutting tool maker.

Warner & Swasey Co has bought the Duplex Truck Co, Lansing, Mich. Founded in 1909, Duplex has been producing the undercarriage for the Gradall, an earthmoving unit made by Warner & Swasey.

Duplex also makes special trucks for industrial and maintenance use, and engine generator sets. The company will continue to operate in Lansing as a W&S division. Duplex stockholders will receive one share of W&S stock for every three shares of Duplex.

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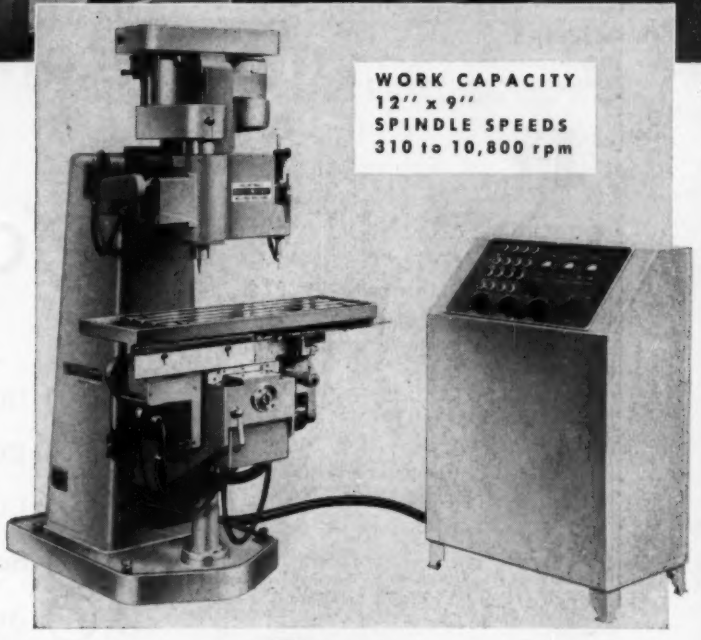

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Spindle, table and carriage are driven through new type, specially designed magnetic clutches which provide maximum sensitivity, continuously variable speed control, and eliminate backlash. Machine can be set to cut 3-dimensional shapes (including square walls) automatically with either table travel and carriage feed, or carriage travel and table feed. Spindle quill "roll feeds" in precision preloaded ball bearings . . . assuring that original high accuracy and rigidity are maintained indefinitely.

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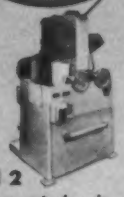
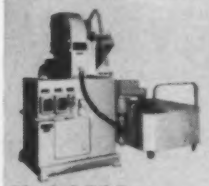
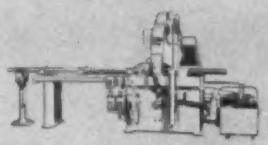


Model 2
Hand-operated submerged cutting machine with 4" diam. capacity.

Model 15
Hand-operated wet or dry machine. Max. cap. 1" diam. solid, 2" tubing.

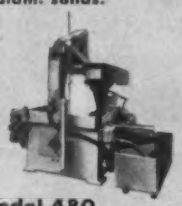


Model 223
Hand-operated bar cutting machine. Cap. 2" diam. solid, 4" tubing.

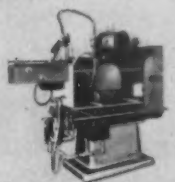


Model 476
Wet abrasive cutting machine with capacity to cut 6" diam. solids.

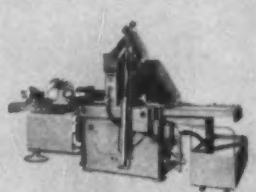
Model 265
Hydraulically-operated with capacity to cut 2" diam. solid, 4" tubing.



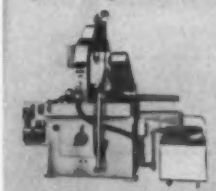
Model 480
For wet abrasive cutting stock to 8" diam. solids.



Model 302
Horizontal wet abrasive cutting machine for flat or irregular shapes.



Model 509
Rotary-oscillating-hydraulic wet abrasive machine. Cuts tubing to 9" diam.



Model 406
High-speed machine with capacity to cut 6" diam. solids in seconds.

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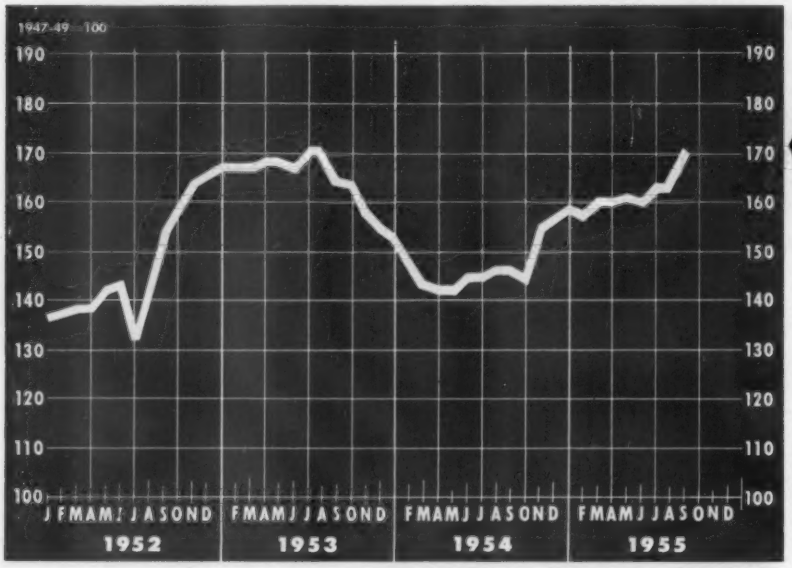


Production Index

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	SEPT. Estimated	AUG. Preliminary	JULY Revised	AUG. Year Ago
Total idex..	171	170	167	148
Machinery	141	138	126	
Electrical Machinery	202	197	181	
Autos	139	155	97	
Other Transportation	140	138	126	
Other Metalworking	140	138	126	

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

Production at new peak . . .

Metalworking production has risen to the highest point ever recorded in peacetime.

It is now back up where it was in mid-1953, when it had the benefit of Korean war production.

Today's volume consists mostly of civilian goods, with military items comprising only a very small percentage of the total.

American Machinist's index is now at 171. A year ago, it was at 147, having been close to that level during a large part of 1954.

Output began to rise last winter . . .

It started to climb in November and stayed around 157-161 for months. The past summer it has been in the area of 163-165. Come September and it went up 8 points.

This startling performance, mind you, is without the kind of extraordinary support from the automobile industry that occurred earlier in the year. Detroit has been, and still is, in the midst of its annual retooling season.

Outlook is very bright . . .

Things look good ahead for Metalworking. Straws in the wind: The record-breaking attendance, buying interest and optimism at the Machine Tool Show in Chicago. Also, the very large spending for new plant and equipment during the remainder of this year, as indicated by polls taken by *American Machinist* and by the Department of Commerce.

Tool and die shop owners, when asked by the National Tool & Die Manufacturers' Association, exuded confidence. Some 63% of them believe business will be either excellent or good during the next year.

Steel buyers are getting nervous over the possibility that they may not secure as much steel as they need during the coming months.

Mills claim that they could comfortably fill first quarter order books if they were inclined to open them.

Aircraft output to dip . . .

Airframe companies in southern California expect employment at the year's end to be down somewhat from the postwar high of midyear.

Backlogs are good, nevertheless, commercial prospects excellent, and production promises to continue at a high level.

Aircraft companies still are farming out a considerable volume of subcontracting work.

Northern California Shops busy . . .

Efforts of plane companies to line up new subcontractors in the San Francisco Bay area have not been successful. Local metalworking firms say that their shop capacity is about full, a good indication that northern California is thriving.

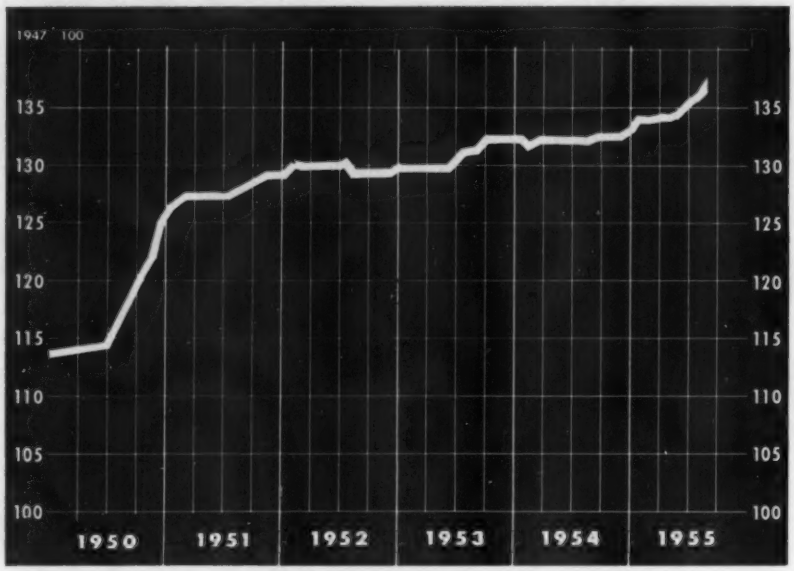
West Coast tool and die people predict that first quarter business will be 25% more than in the same period this year.

Railroad car builders have recently been deluged with the largest volume of orders in a long time. In view of the long lead time required in freight car manufacture, the industry should be busy throughout 1956.

Gaging Business . . .

Price Index

	SEPT. Estimated	AUG. Preliminary	JULY Revised	AUG. Year Ago
Total Index	**137.5**	**139.9**	**135.8**	**132.6**
Metalworking Machinery		**156.5**	**155.4**	**141.7**
Other Machinery exc. Electrical		**141.9**	**140.3**	**137.4**
Electrical Machinery		**132.8**	**131.9**	**130.9**
Fabricated Metal Products		**132.4**	**131.5**	**129.1**



AMERICAN MACHINIST INDEX OF METALWORKING PRICES

Brake on the boom?

While business continues its upswing, the Federal Reserve Board's new, tighter credit restrictions may put a brake on the boom.

Housing would be hardest hit by the credit squeeze. And along with it go such contributory industries as plumbing goods, metal fabricating, road construction, and many others. In fact, housing starts have already started to decline. July's new starts were lower than year-ago figures for the first time in 1955.

But both business and consumers appear so well stocked with cash that it may take many months for tightened credit restrictions to show up in any appreciable degree. Nevertheless, restricted credit will make it tough for many businesses to show big gains over recent performances.

Two factors could keep the boom going . . .

. . . in spite of stiffening credit: tax cuts and increased government spending. The budget for the 12 months ending next June shows only a $17-billion deficit and any current combination of lower spending and higher revenue now could balance it by June 30, 1956.

Then you can look for tax cuts, early enough and substantial enough to take much of the sting out of the tight credit policy. Personal taxes could be cut as much as $3 billion, and corporate taxes as much as 50%.

Federal spending for civilian purposes (more pay for government employees, farm price props, increased social security, more highways, school and dams) is in for a substantial gain.

This increase, coupled with the stimulation of tax cuts, could easily offset restricted credit and put Washington back in the role of supporting the business boom in a big way—desirable with elections looming.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49 = 100)*	139.6	139.7	121.8
Steel ingot production (thousand tons)	2,295	2,264	1,583
Electric power output (million kilowatt hours)	10,155	10,706	8,808
Production of automobiles and trucks	99,563	105,680	84,743
Engineering construction awards (*Eng. News-Record*, millions)	$381.2	$375.7	$306.4

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	323	397	325
Vacuum cleaners sales (thousands of units)	208	242	194
Washers sales (thousands of units)	246	354	243
Household electric ranges sales (thousands of units)	87	105	80
Radio production (thousands of units)	718	1,205	437
Television production (thousands of units)	344	590	307
Gear sales index (1947-49 = 100)	201.7	193.5	141.3
Foundry equipment new orders index (shipments, 1947-49 = 100)	N.A.	186.8	68.8

*Seasonally adjusted
N.A. Not Available

No. 1 in a series

AHEAD

STEPS

You get demonstration of your work and complete job development record

FOUR

Cone submits samples of your work

BE

Cone makes recommendations

You send print to Cone

Cone's four-step carbide development service obligates no one to purchase a Conomatic. It simply demonstrates what it takes of machine, personnel, and tools for profitable use of 100% carbide tooling on multiple spindle bar automatics.

Clients of this service have praised it highly. Some have used it for immediate production advantage. A lesser number have used it in preparation for anticipated competition later. All are completely convinced that an "automatic" proved superior for carbide is a superior "automatic" for hss.

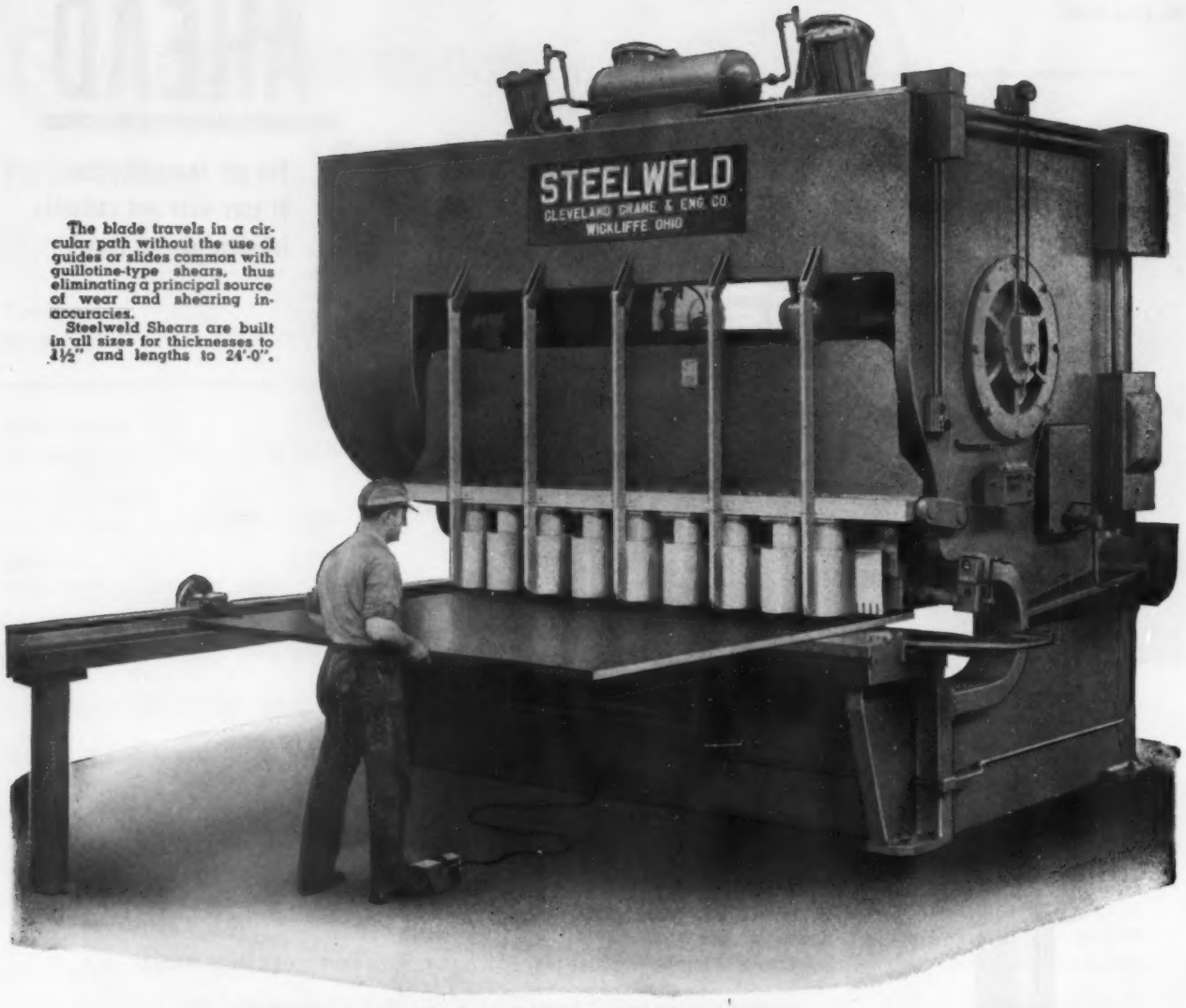
DATA FOR COMPARISON

Part.....Support Post	Length.....5¾" Cutoff 4¼" Turn 2" Thread
Machine.....1⅝" Conomatic	
Tools....100% Carbide Tipped	RPM.....1562 Work Spdl. 1022 Thr'd Spdl. 2584 Total Eff.
Material.....X-1112	
Stock Size.....1¼"	Time.....15 Secs.

Conomatic

Write, wire, or phone today for particulars on "Four Steps With Cone".

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.



The blade travels in a circular path without the use of guides or slides common with guillotine-type shears, thus eliminating a principal source of wear and shearing inaccuracies.

Steelweld Shears are built in all sizes for thicknesses to 1½" and lengths to 24'-0".

CUTS 1½" PLATE

22 cuts per minute can be made in plate up to 1½"x8'-0" with this powerful, heavily constructed shear.

Operation is noticeably quiet because blade counterbalances cushion the blow.

All thicknesses are easily cut with accurate, smooth, burr-free edges because of Steelweld's popular fast micro-set knife adjustment.

Steelweld's low-inertia clutch-brake unit provides quick, positive clutching and braking with very little slippage. Thus heat and wear are minimum.

Carefully size up this machine or any shear in the Steelweld line, and we believe you will agree that Steelwelds are the most outstanding available today.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1444 EAST 282 STREET, WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

You Can't Afford Not To

Many of you visited the recent Machine Tool Show in Chicago and got the surprise of your lives. You saw for yourselves just how spectacular have been the achievements in machine technology since the previous show eight years ago.

"We could not have known that most of the machines we saw at the 1947 show would be obsoleted before the 1955 show was staged," William Newberg, president of the Dodge Division of Chrysler Corporation, said. "But that is literally what has happened. It shows how fast the tools which help to build the future become part of the outmoded past."

For the truth is that the newly designed machines on display at Chicago are proof in themselves that a very large percentage of the machine tools now installed in metalworking plants are definitely a part of the outmoded past. **These machines, not necessarily old in age but undeniably old in design and in performance, cannot compete with the new ones in lowering the cost of production.**

And that brings us to the problem that is looming constantly larger in the minds of metalworking management men. The wage pattern for Metalworking has been pretty well set by the General Motors and Ford agreements. Hourly rates are heading skyward once more. And over-all labor expense is very much up. Prices of raw materials have risen impressively, after a considerable period of steadiness.

Meanwhile the buying public is in no mood to pay more for goods. They have become accustomed to bargains and to discounts. So-called fair pricing laws don't mean much these days. Prices tend to seek their natural level in a highly competitive market.

Metalworking companies thereby are in a real dilemma. They are faced by higher labor and materials prices. Yet they dare not pass on to consumers more than a fraction of this new expense. This squeeze will lead inevitably to greatly reduced profit margins unless something is done to prevent the shrinkage.

There is one logical way out of the dilemma. Cut production costs. Invest in new machines that slash your manufacturing cost per piece. For your own profit, make use of the startling advances in machine technology so admirably and vividly displayed at the Chicago Show.

Where do you start? That's easy. Make a list of the oldest machines in your plant. Then the next oldest. And so on. At this point figure out what your savings will be if you replace these oldsters with new machines that you saw at the Show.

Perhaps you will use the MAPI formula or some simpler means of determining not only what you will save if you buy 1955 machines, but, even more to the point, what it will cost you if you keep the old stuff.

Remember that you can recover your capital spent on new machines a lot faster than you used to. New tax rules are now in effect. They enable you to write off two-thirds the cost within half the useful life.

Your list will be the beginning of a workable and practical replacement program. You then can figure out how much of the program you can finance at the start. Once committed to such a program, we will wager that you will continue it on a permanent basis.

Burnham Finney

CINCINNATI accurately shears

1/2" plate... and 20 gauge sheets

...without changing knife clearance

... You do not change knife clearance for successful shearing of different thicknesses on a Cincinnati. Just set the clearance for the thinnest material and shear all thicknesses up to capacity. Thousands of Cincinnati Shears are used continuously in this manner. This practical method prevents accidental damage—saves time. Remember, changing knife clearance interrupts production.

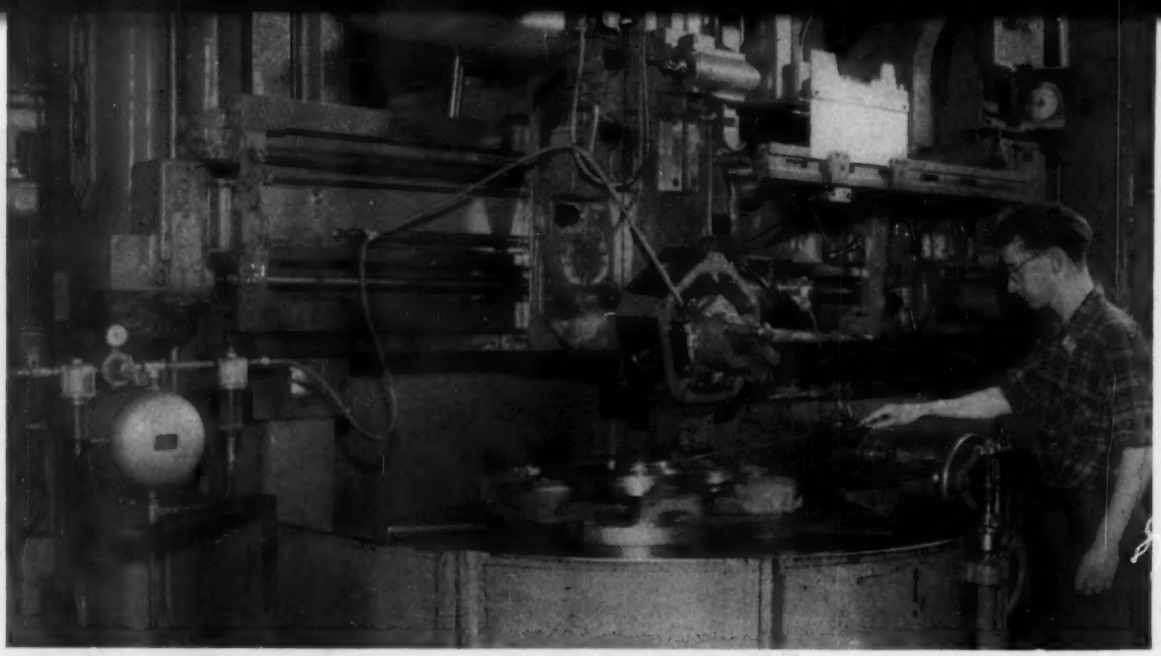
Sharp knives are a necessity for satisfactory shearing, especially on very light gauges. Remember, changing knife clearance does not sharpen dull knives. We suggest you write for data sheet on knife life.

Write for Catalog S-7 ... describing Cincinnati Shears

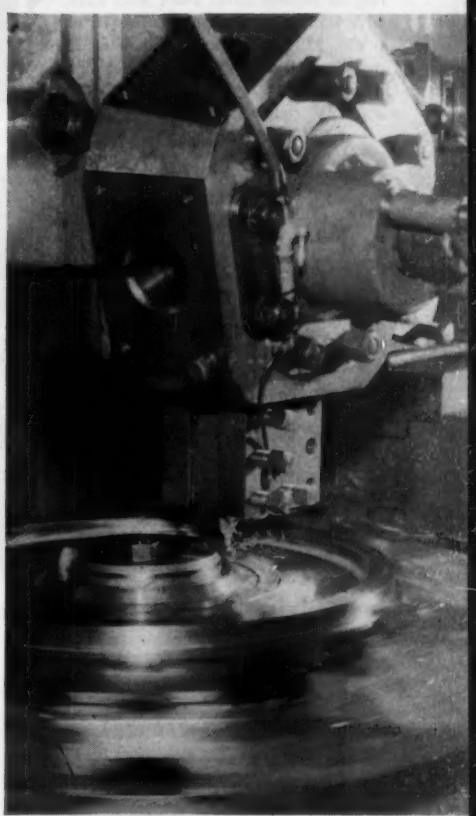
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI



TURBINE DISK is profiled on a boring mill, using tracer attachment, at 460 sfpm. Material is chrome ferritic steel (11% Cr-Mo-V-Cb) heat treated to R_c 32-38, and required surface finish is 32 mu in. rms or less. Cutting tool is Grade K4H tungsten carbide. Mist coolant is supplied from tank (left, above) and applied to tool face through small tube (right)



Orenda switches to mist cooling

E W BARTLE, special assignment engineer
ORENDA ENGINES LTD, MALTON, ONT, CANADA

Substantial savings have been effected by machining components of the Orenda turbo-jet engine with the aid of mist cooling, rather than with CO_2 or the conventional flood system. Cutting speeds and feeds have not been materially increased, but tool life has been extended substantially, in many cases up to and over 100%. And surface finish has been greatly improved.

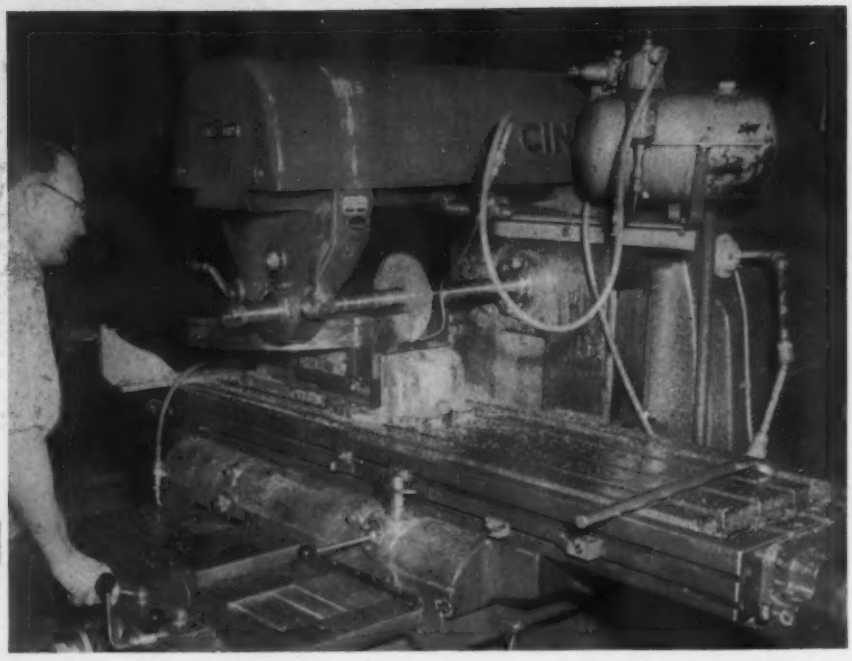
Cost is approximately 9¢ per 8-hr day per nozzle. Air for the spray system is supplied by the regular shop system and is reduced to 60 psi and passed through an air cleaner.

Particular advantages of mist cooling are that the operator can see the tool in contact with the work, his machine is clean, and his clothes and person are dry. There is no possibility of coolant turning rancid, as in a sump, and no place for bacteria to breed. Furthermore, there is no downtime for pumping out, cleaning, and refilling the machine.

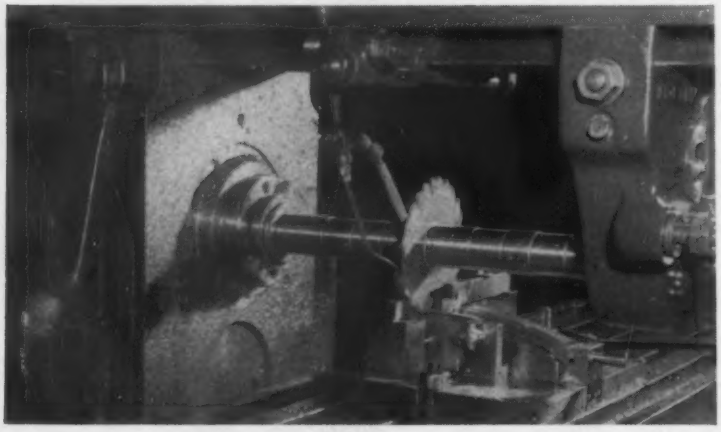
American Machinist

Orenda switches to mist cooling ...

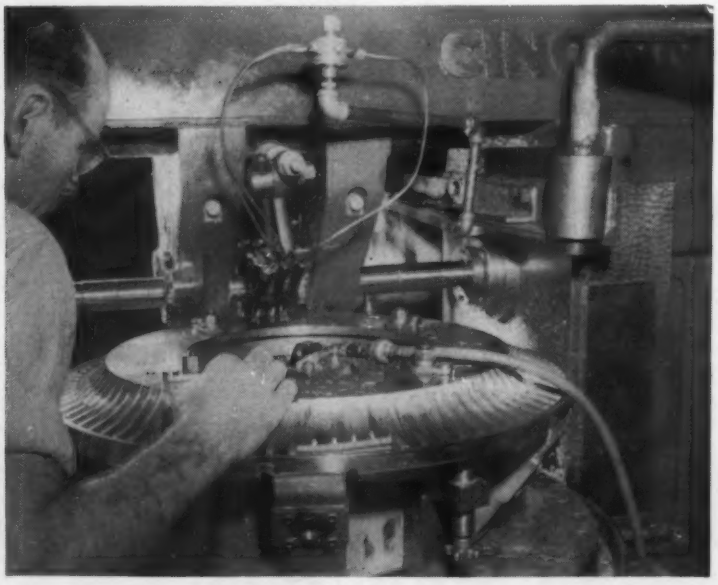
continued



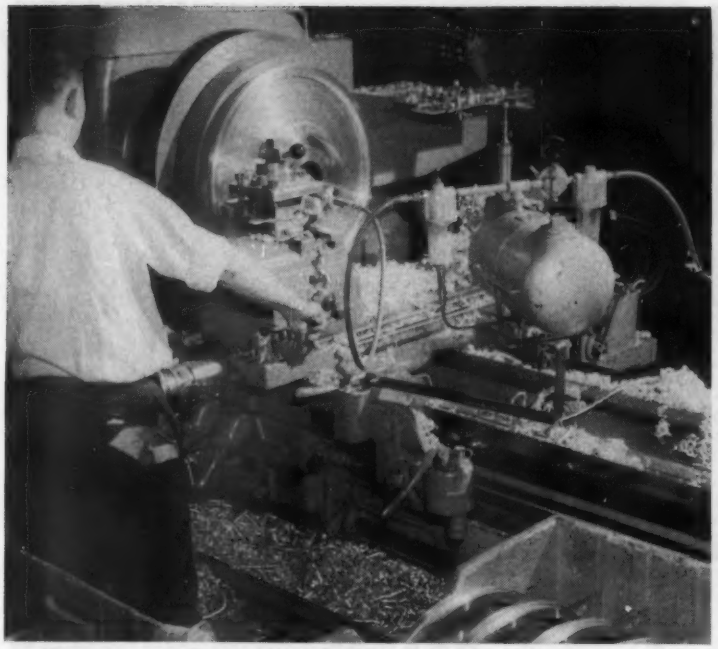
SHROUD RING SEGMENT is sawed from ring of chrome-nickel steel, AMS 5365, with HSS triple-chip-grind saw, 10 in. in dia, 3/32 in. thick, operating at 80 rpm. Feed is 2⅝ ipm, and mist cooling is used



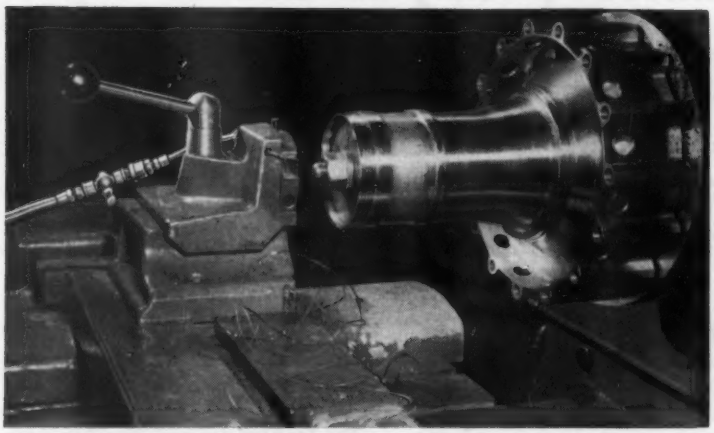
SLOTTING OPERATION on shroud-ring segment involves cutting a slot 0.250 in. wide, 0.187 in. deep, with a 6-in. HSS cutter running at 78 rpm. Feed is 2¼ ipm. Material is AMS 5365



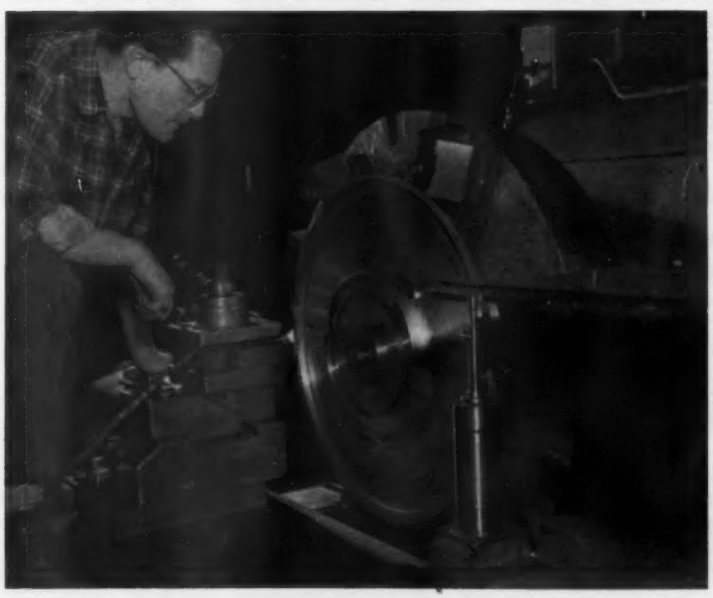
GANG MILLING with 6-in.-dia HSS cutters produces 91 lugs 0.309 in. thick in AMS 5645 chrome-nickel-steel inner casing. Speed is 57 rpm, feed 4½ ipm. Note manifold arrangement for feeding the mist coolant to the three cutters



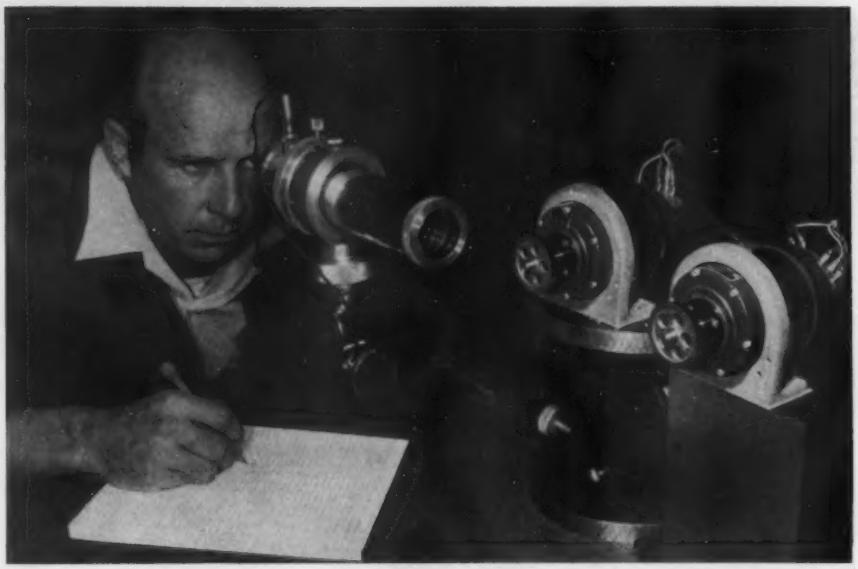
ALUMINUM-ALLOY rotor disk is contour faced and turned with a carbide tool at 1800 sfpm. Mist-coolant tank is carried on brackets attached to lathe carriage; spray tube is held in square turret



THREADS ARE CUT on a turbine rotor shaft of AMS 6415 steel, R_c 34-38, with a single-point, Grade GX, tungsten-carbide tool at 265 sfpm. Thread is 4.400 in.-dia, 12 tpi, Class 3. Coolant tube is screwed into toolholder



STEEL ROTOR DISK, AMS 6382 chrome-moly steel, R_c 25-29, is profiled and the rim faced at 482 sfpm, using Grade K4H carbide tool. Mist coolant is fed to tool tip through tube held in the square turret



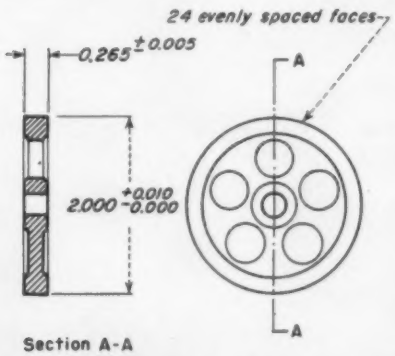
ANGULAR LAG is calibrated by noting relative position of images of polygon faces (on wheels fastened to shafts of the two synchros) on fiducial scale of the auto-collimator

Auto-collimator quickly measures small

Rotational lag of a synchro system was determined in 30 min by comparing displacement of polygonal surfaces. Observational error amounted to only ± 10 sec of arc. Here is a trick you can adopt for measuring small angular differences or deflections

J C MOODY, Physical & Electrical Standards Dept, SANDIA CORP, SANDIA BASE, ALBUQUERQUE, NM

The auto-collimator or auto-collimating telescope, an optical instrument used to measure small angular differences, changes, or deflections, is finding new uses in industry. An unusual calibration problem was recently solved with the auto-collimator in a way that illustrates the usefulness of such instruments in making dimensional measurements.



OPTICAL POLYGONS have 24 faces, or stations, 15° apart. Size of face is the minimum that will give a clear image in the auto-collimator

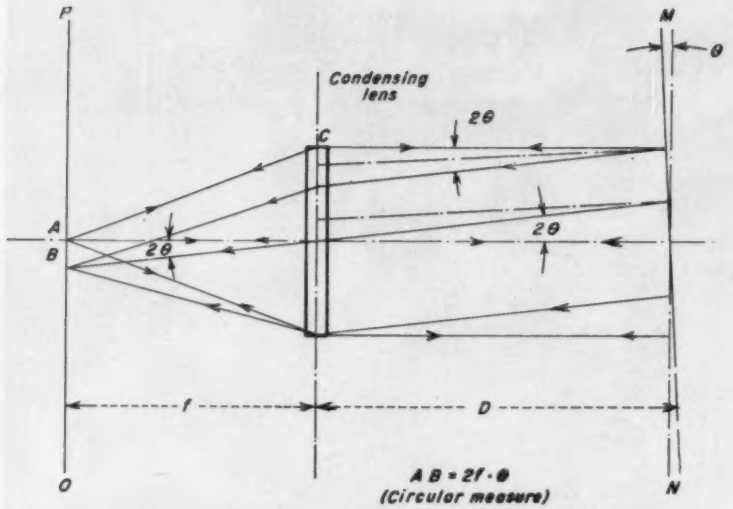
The problem was to measure the rotational lag between a synchro generator and a synchro motor. Specifications were that this lag could not exceed 36 min of arc throughout 360° of rotation within the load rating of the synchro receiver. Testing this condition with conventional equipment would have necessitated an involved and cumbersome procedure. The auto-collimator with two especially designed optical polygons made possible a rapid, economical, accurate solution.

HOW TARGETS WERE MADE

Two polygons were designed, each with 24 faces approximately ¼ in. square. The number of faces was based on the assumption that 24 stations, 15° apart, would provide a reasonable sample of the over-all synchronization between the generator and the motor. Size of the faces was established as the minimum that would reflect a clearly defined image to the auto-collimator. Liberal tolerances were allowed the manufacturer on the 15° face angles. However, to insure uniformity between corresponding faces of the two polygons, they were ground and lapped in tandem.

The transmitter and receiver were mounted securely to a tilting table, and a universal angle was set up on a surface plate. The polygons were then mounted on the generator and motor shafts and oriented so reflecting faces were normal to a common plane perpendicular to the axis of either shaft. The auto-collimator was likewise placed on the surface plate.

To make the test the angle plates supporting the generator and receiver were positioned so an image from one face of the polygon on the transmitter and the image on the corresponding face of the polygon on the receiver were superimposed on the fiducial scale in the auto-collimator. The transmitter was then turned clockwise until the image of the next face coincided with the original reference in the scale. Angular deviation of the image produced by the polygon on the receiver was noted and recorded. This process



SCHEMATIC PATH of light rays from reflecting surface (the polygon face) to the image plane in auto-collimator discloses that position of the reflected image on scale is not a function of distance to the object tested

angular differences

was continuted throughout the 24 stations and the results tabulated. The entire test required only 30 min.

Presentation of information obtained with the auto-collimator frequently evokes questions about the effect of the distance between the reference reflecting surface and the auto-collimator. The truth is that the position of the reflected image on the fiducial scale is not a function of this distance. This can be illustrated by a look at the optical system.

In the schematic path of the light rays, let *A* be a pinhole aperture at the focal point of condensing lens *C*. The light rays passing through this aperture will be bent or refracted by the condensing lens parallel to the ray that passes through the optical center of the lens. If the reflecting surface *NM* is tilted at an angle Θ to a line normal to these parallel rays, the reflected rays will form an angle 2 Θ with these incident rays. The reflected rays converging at point *B* will produce an image at point *B* on the image plane *PO*. From the geometry of this schematic it is apparent that the distance *AB* is equal to twice the focal distance times Θ (expressed in circular measure). Thus, distance *AB* is a function of the focal length and of the angle of tilt and is not affected by the distance *D*.

Use of optical methods of measurement has of late become more common in the field of dimensional measurements. This presentation is offered in the conviction that even greater use can be made of optical methods as knowledge of the instruments and their use increases.

Rotational Lag of Synchro Motor to Synchro Generator

STATION		AMOUNT OF LAG
1	0′	0″
2	–1′	20″
3	–9′	20″
4	–14′	40″
5	–17′	40″
6	–8′	20″
7	–11′	20″
8	–4′	20″
9	–11′	40″
10	–11	20″
11	–14′	40″
12	–7′	20″
13	–9′	20″
14	–6′	40″
15	–8′	20″
16	–14′	40″
17	–18′	20″
18	–14′	20″
19	–8′	40″
20	–7′	20″
21	–12′	40″
22	–10′	0″
23	–8′	0″
24	–12′	40″

An observational error of ± 10″ of arc is possible in this test of rotation.

Help New Men Hit Their Stride

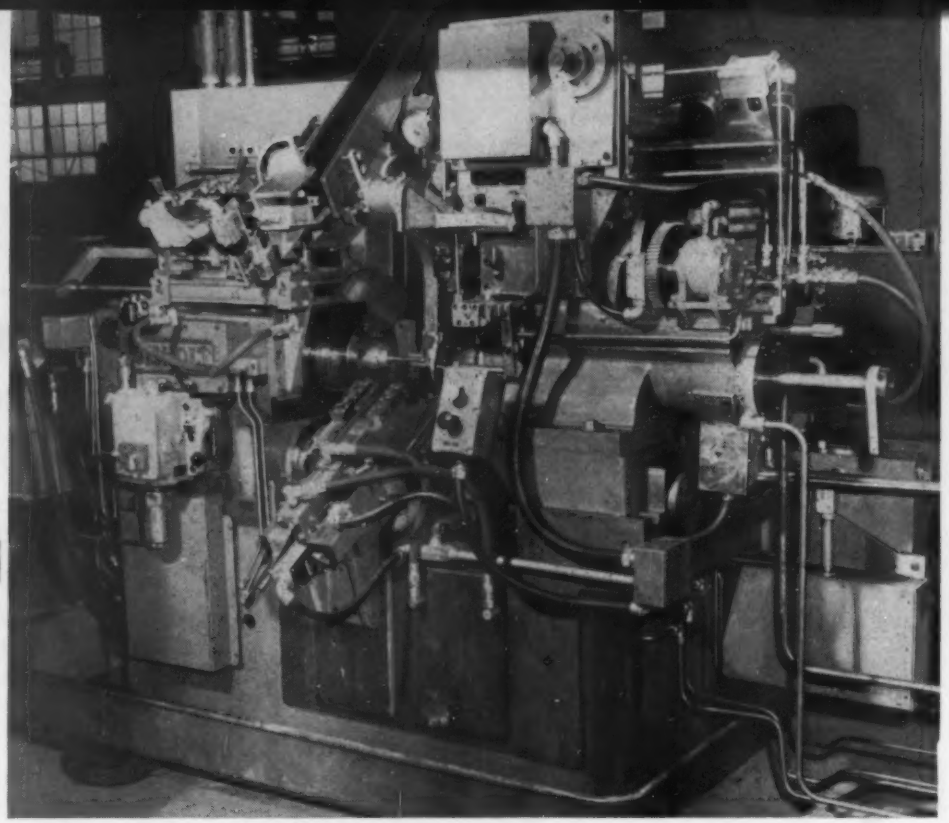
BY EARL F LUNDGREN

Three elements most important in starting a new man on his job are a continuing welcome, a feeling of accomplishment, and a follow-up from the personnel department.

True, most firms welcome a man his first day on the job, but they often feel that is enough. If this happens, the new man may forget the atmosphere of the first few days, and begin to feel ignored and useless. If the company makes it a point to maintain a continued hospitality, the new man will begin to feel that maybe the company is glad it hired him after all.

Even during the first few months, a man should feel that his efforts are worth something. A conscientious person will brood over the idea that he is not doing anything worthwile. We all realize the value of a new man is limited, but, if at all possible, the company should make a man feel productive. In formal training, unproductivity is accepted, but in on-the-job training, where everyone around him is adding something to the company output, a sincere person wants to do more than just learn.

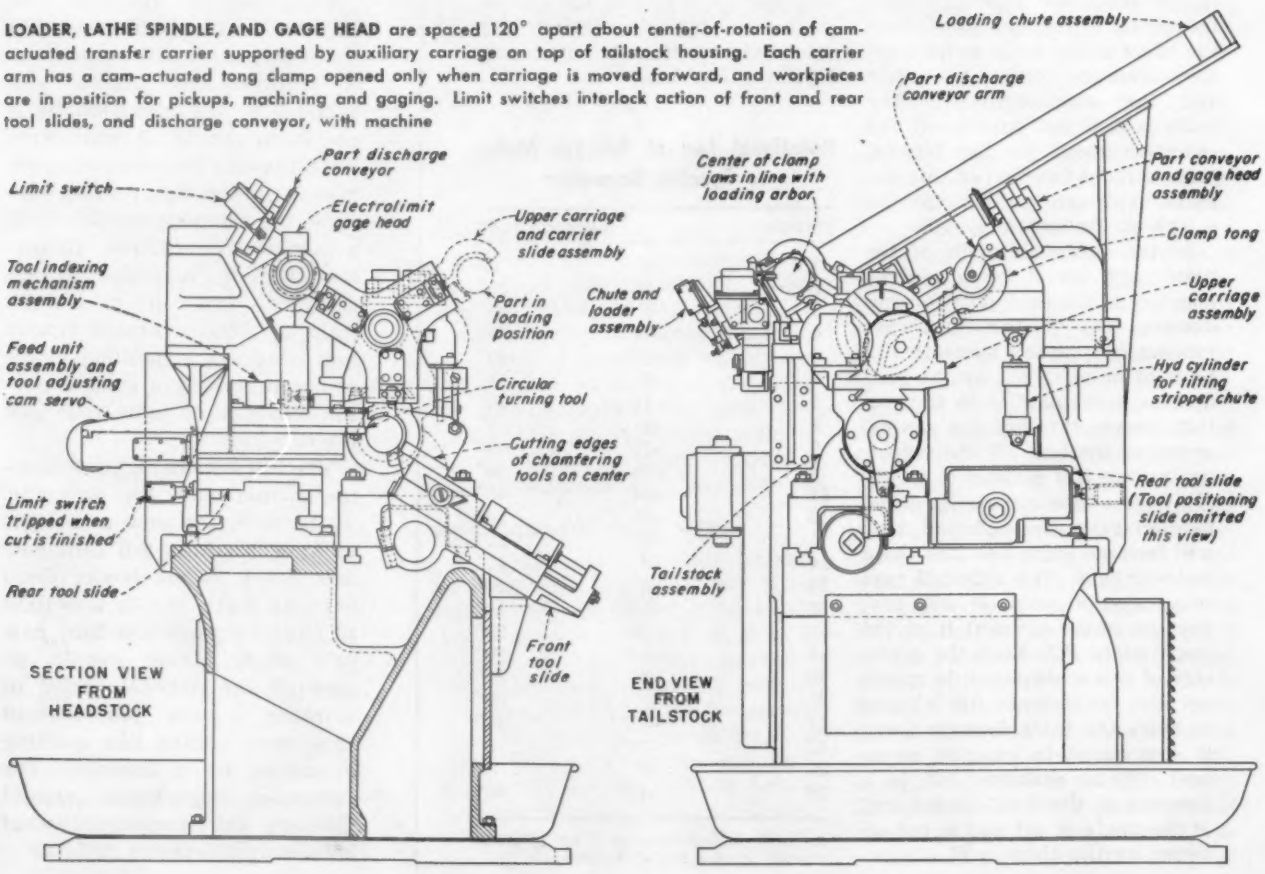
The third element, the follow-up, supplements the welcome. To be sure, the new man likes to have his boss tell him how he's doing (some bosses don't even do that), but he also likes to have someone *ask* him how he's doing. Few people go through the difficult period of learning a new job without sometimes feeling like quitting or asking for a transfer. The personnel department should take on this responsibility of bolstering the man's morale.

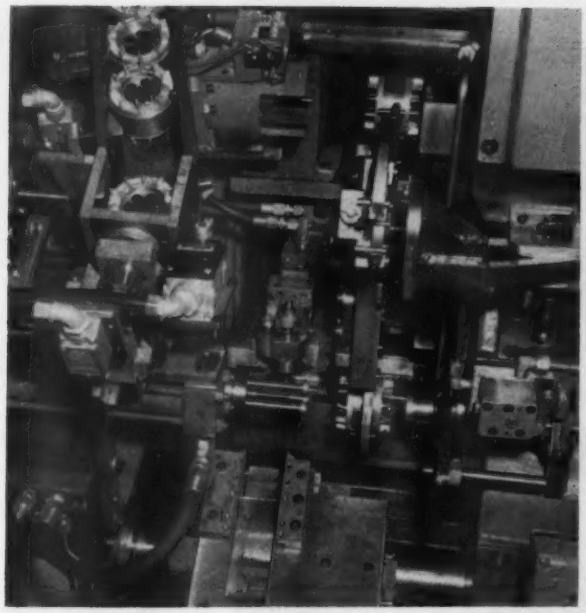


TOOLED FOR TURNING SMALL MOTOR ROTORS in 14-sec automatic cycle, this 15-hp Gisholt hydraulic lathe uses Electrolimit gage to check each piece and reset turning tool to compensate for wear of cutting edge. Depth of cut is 0.015 to 0.020 in. when turning 2½-in.-long rotor cores to approx 3.500-in.-OD finished

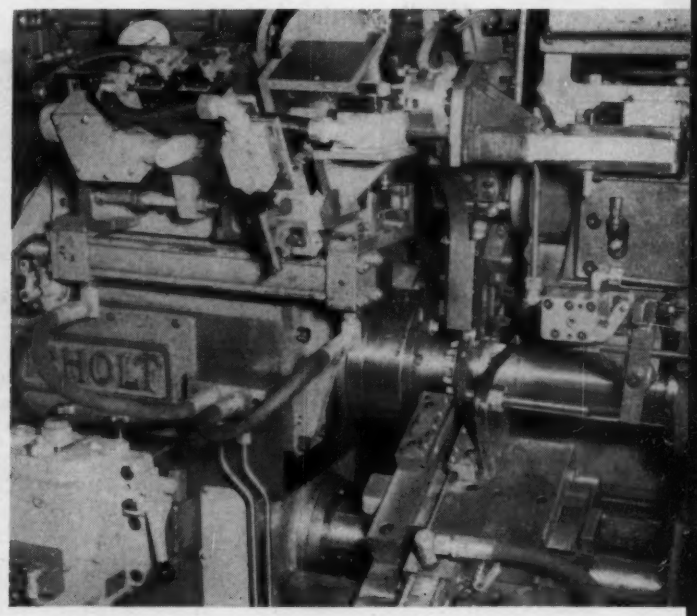
Gage checks itself, controls turning tool in

LOADER, LATHE SPINDLE, AND GAGE HEAD are spaced 120° apart about center-of-rotation of cam-actuated transfer carrier supported by auxiliary carriage on top of tailstock housing. Each carrier arm has a cam-actuated tong clamp opened only when carriage is moved forward, and workpieces are in position for pickups, machining and gaging. Limit switches interlock action of front and rear tool slides, and discharge conveyor, with machine


Loading chute assembly
Part discharge conveyor arm
Part discharge conveyor
Limit switch
Electrolimit gage head
Upper carriage and carrier slide assembly
Center of clamp jaws in line with loading arbor
Part conveyor and gage head assembly
Clamp tong
Tool indexing mechanism assembly
Part in loading position
Chute and loader assembly
Upper carriage assembly
Feed unit assembly and tool adjusting cam servo
Circular turning tool
Hyd cylinder for tilting stripper chute
Cutting edges of chamfering tools on center
Limit switch tripped when cut is finished
Rear tool slide (Tool positioning slide omitted this view)
Rear tool slide
Tailstock assembly
Front tool slide
SECTION VIEW FROM HEADSTOCK
END VIEW FROM TAILSTOCK



WITH TAILSTOCK AND AUXILIARY SLIDE WITHDRAWN, carrier (center) is indexed 120° to move rough rotor from loader to lathe spindle, and turned rotor from spindle to gage. Loader (upper left) has retracted 90° to pick up next rotor from chute. Three ejector pins in spindle nose have serrated pads on ends to act as drivers



WITH TAILSTOCK QUILL AND AUXILIARY SLIDE FORWARD, turned piece is inserted in gage, rough piece is placed on spindle mandrel, and clamp is positioned to pick up rough rotor from loader. Plate on quill moves spring-loaded r-h chamfer tool block to suit length of rotor being machined. Clamp tongs are actuated in this position

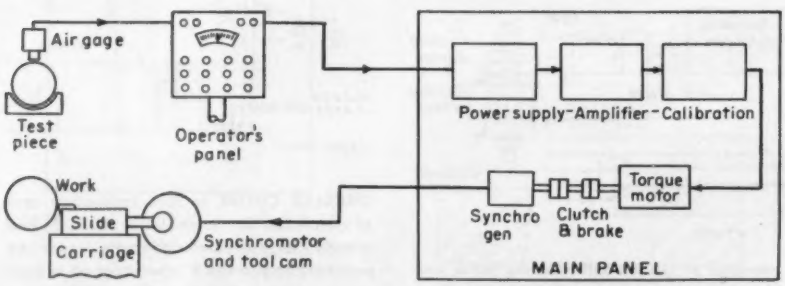
automatic self-resetting lathe

GEORGE M CLASS, vice president — Engineering, GISHOLT MACHINE COMPANY, MADISON, WIS

Automatic rechecking of gage-head accuracy is a feature of several high-production automatic lathes made by Gisholt for turning the laminations of diecast rotors for small fractional-hp induction motors. One was just demonstrated at the Machine Tool Show.

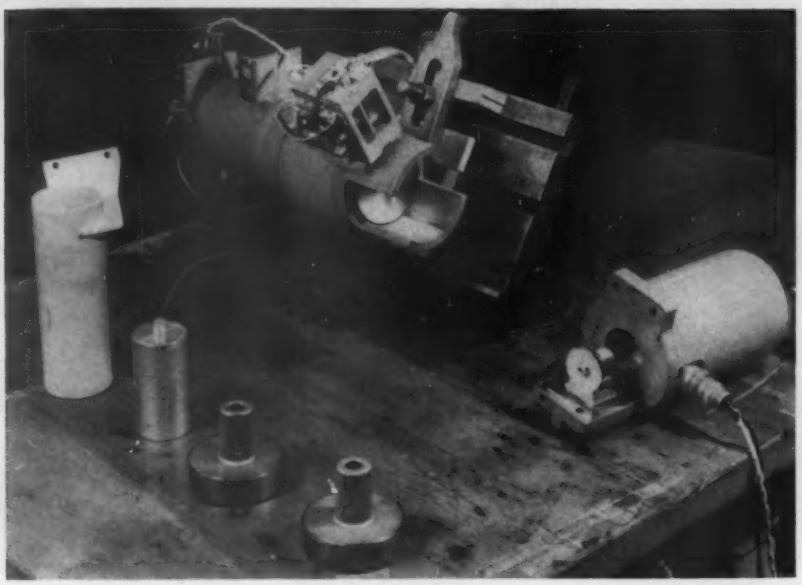
Design is based on cooperative development studies made by General Electric and Gisholt engineers. These lathes automatically transfer rotors individually between loading, machining and gaging stations, then discharge rotors to a 3-chute sorter that separates them into undersize, within-tolerance, and over-size groups. Because, in most cases, machining tolerances held by the machine and gage control system are well within dimensional tolerances, rotors occasionally delivered to the undersized and oversize chutes almost always are acceptable parts. They are kept separate for control purposes.

Basically, each machine is a Gisholt No. 12 automatic lathe with 15-hp spindle-drive motor, a special indexing transfer carrier with cam-actuated clamp tongs for moving workpieces between stations, a loading chute and a sorting discharge conveyor, an automatically adjusted tool slide on the rear carriage for the circular turning tool, two chamfering tools on the front slide, and an arrangement for automatically positioning the right-hand chamfering tool to compensate for minor variations in lamination stack lengths. Spindle speed is 1200 rpm, feed range 0 to 0.054 ipr.

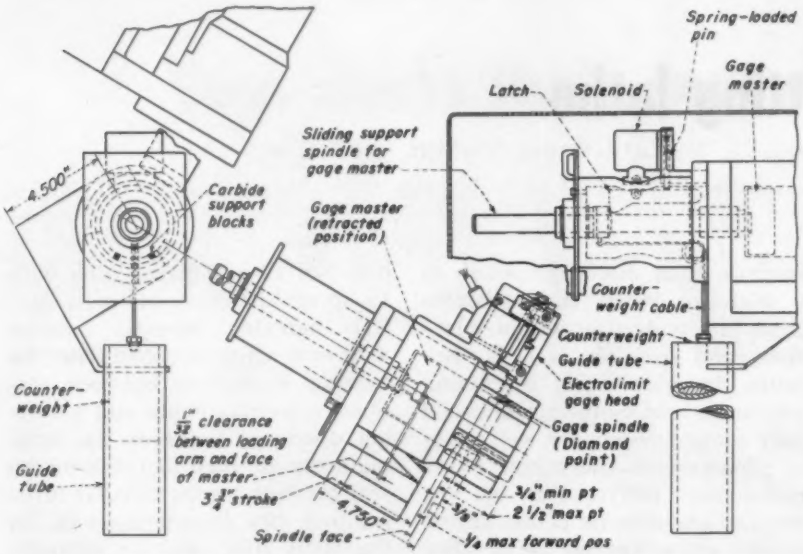


PRINCIPLE OF THE GAGING DEVICE. A separate gaging position makes it possible to check the gage readily with masters

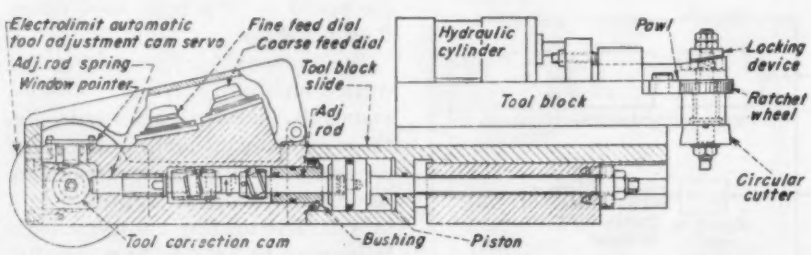
By proper proportioning of work-handling devices, chutes, mandrels, ejectors, gage heads, etc, these lathes can handle motor rotors with lamination stacks approx ¾ to 4 in. long, and approx 3 to 8 in. OD. The loading chute for each lathe may be kept filled manually, or can be arranged for automatic refilling from a passing conveyor. Finish-turned rotors can be de-



PRINCIPAL ELEMENTS of P & W Electrolimit gage system are: gage head with master gage holder (upper center), counterweight and guide tube (left), zero and maximum size chromium-plated gage masters (lower center), and servomotor with tool-adjustment cams (right). Spindle of Electrolimit gage has a diamond point



TWO CEMENTED-CARBIDE BLOCKS support workpiece in gage head while it is checked with diamond-pointed spindle of Electrolimit gage. Counterweight moves faster forward to check gage when latch is released by solenoid. Master is returned by loading arm when next workpiece is moved into gage for checking. Gage controls three servomotors



SERVOMOTOR-CONTROLLED TOOL SLIDE on rear carriage of Gisholt self-resetting lathe has hydraulically indexed, 2-in.-OD solid circular carbide cutter which is indexed 48 times before regrinding. Tool-block slide is precision-adjusted by dials which turn threaded adjusting rods. It is reset to neutral each time cutter is indexed to new surface

livered to passing conveyors, or to chutes for transfer to subsequent work stations.

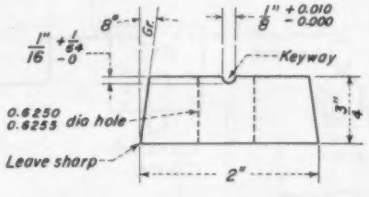
Heart of the control system for each lathe is a specially developed Pratt & Whitney automatic Electrolimit gaging and machine control unit made integral with the lathe mechanically, electrically and functionally. Manual and automatic cycling of the machine requires, in addition to the gage head and its three servomotors, a total of 25 limit switches, 14 pushbuttons, and 8 solenoid-actuated hydraulic valves. Master plug gages "standardize" the Electrolimit gage at periodic intervals: (1) automatically after each out-of-tolerance piece is indicated, and (2) manually as required.

The control system actuated by the Electrolimit gage performs four principal functions within less than 2 sec after a machined rotor has been inserted in the gage head:

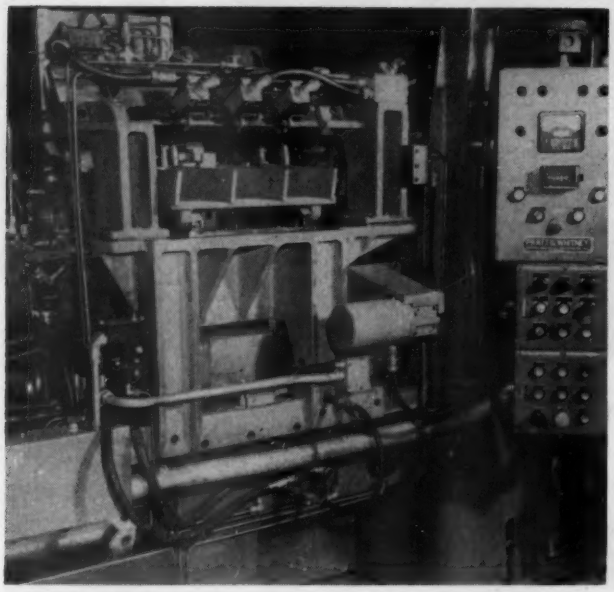
1. The gage determines if the part is within tolerance, undersize, or oversize—and how much it is out of tolerance, if any.

2. Through a series of servomotor controls, the gage resets the turning tool on the rear slide of the lathe to compensate for measured tool wear. When total allowable wear for a given tool surface has been exhausted, this control also initiates indexing of the circular turning tool to bring a new cutting surface into position, and returns tool-correction cams to their neutral positions. When the machine and all controls are functioning correctly, finish-turned rotors should not vary more than 0.0005 in. from the nominal OD dimension.

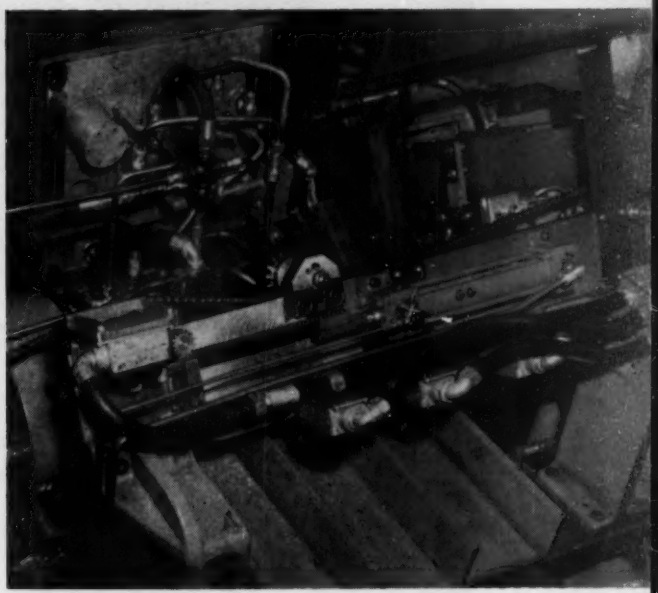
3. Through a series of latch-type relays and limit switches, the



CIRCULAR CUTTER to turn lamination core of small motor rotor is 2 in. OD and ground to 16° included-angle taper on periphery to provide 8° clearance all around cutting edge. Carboloy Grade 350 gives approx 3000 parts per regrind in average use



CONTROL STATION is beside rear tool slide (center), where adjustments for tool settings are made, and near three-compartment discharge chute (between conveyor-support brackets), where machined rotors can be picked up for checking. Dial on control panel shows gage readings off nominal size



WHEN DISCHARGE-CONVEYOR ARM HAS MOVED out to unloading position, the three-compartment chute is raised hydraulically to strip rotor from support pin on conveyor arm as arm is returned to gage position. Chute then is lowered to clear next rotor, when it is moved out of gage head

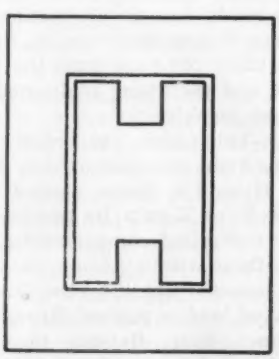
gage determines into which of three chutes (undersize, within-tolerance, or oversize) the gaged part is to be delivered.

4. Then the gage releases the machine control circuit to permit machining of the next workpiece. Should the previously gaged part have been out-of-tolerance, the gage will immediately shut down the machine for readjustment or corrective maintenance if the succeeding part gaged also is out-of-tolerance—in either direction.

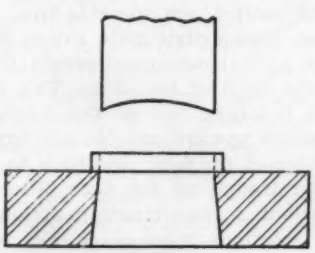
After the lathe has been shut down for any reason — between shifts, or for correction of some malfunctioning element — it cannot again be put into automatic operation until the setup man has paced the machine through its cycle functions manually by push-button control, and the lathe has produced a piece acceptable to the gage. Incidentally, when the start button is pressed following a shutdown, a 5-min time-delay relay prevents cycling of any elements until the gage circuit has warmed up.

DIEMAKER'S KINKS

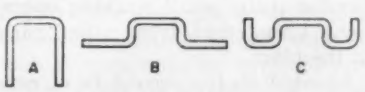
FEDERICO STRASSER



NESTS for second-operation dies need not exactly follow the complete contour of the blank, but only significant features that will assure accurate location. For example, the H-shaped blank is properly located in a rectangular opening that corresponds to the two principal dimensions of the workpiece, plus suitable clearance.



SHAVING PUNCHES should always have sharp cutting edges. Because they remove only small amounts of metal, it is convenient to hollow grind them.



COMPOUND BENDS should be started at the center of the workpiece, as at *A*, and progress outward as shown at *B* and *C*. Stretching of the stock is thereby not confined to portions locked in the dies. If only a limited area must take the entire bend, that area may be subject to overstressing and fracture.

Water-wash spray booths are lighted by explosion-proof fluorescent fixtures. Explosion-proof incandescent fixtures are used for general lighting

Paint shop pays production

Taking a dose of its own medicine, this company equipped its new painting setup with explosion-proof electrical equipment to meet all requirements of National Electrical Code

Expansion of production facilities at Crouse-Hinds Co, Syracuse, NY, gave plant engineers an opportunity to install a complete new cleaning and painting setup to replace the old department. The old dry-type booths caused air pollution and required excessive stack cleaning, in addition to the whole department being too small, lacking production capacity, and being poorly equipped.

As now set up, the new enamel and washing dept delivers about 30% more production and, in addition, handles many small washing operations transferred from other parts of the plant.

Located on the second floor, near the assembly dept, the new paint room covers 7800 sq ft. Work is shuttled in and out by power trucks, using two electrically operated doors at each end. Near the spray booths are a well-ventilated paint-storage room, a furniture-refinishing room, and a foreman's office.

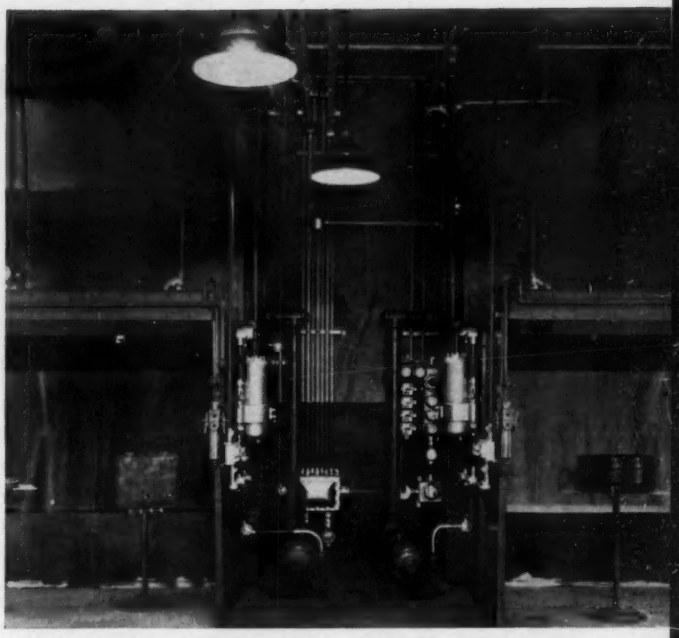
For the first operation, degreasing, 15 dip tanks are provided. The major cleaning solution is hot alkali, but several stainless-steel tanks contain phosphoric-acid solution for cleaning and etching aluminum, and for removing scale, flux, and rust from iron and steel parts. About half the cleaned work goes directly to assembly or stock; the remainder is accumulated in the central area for painting.

The tanks have several features that insure operator convenience, high-quality cleaning, easy control and maintenance. They are in a pit, so the operator stands at a convenient work level, and all supply and drain valves, as well as the air-hoist control, are operable from the front. Steam plate coils, rather than pipe coils, concentrate ample Btu's at the front of the tanks. This creates a rolling boil so the solutions circulate upward over the coil, across the top of the tank, and back to the scum trough at the rear. Thus, a constant surface-cleaning action of the solutions takes place. For easy removal and cleaning, the coils are installed with unions accessible from the front of the tanks.

Cleaned parts to be painted are routed from the central storage area to any one of seven DeVilbiss water-wash spray booths. Each booth's ventillating fan exhausts 12,000 cfm, drawing overspray away from the operators. 750 gpm of chemically treated water are pumped through each water curtain, removing all paint solids. As a result, stack maintenance is now unnecessary. Sludge is partially removed from the tanks daily, and each tank is drained and cleaned weekly.

The batch-type gas-fueled paint baking oven, manufactured by Michigan Oven Co, bakes racked parts at 350 F for 30 min. Its two individually controlled compartments each holds three trucks. As one truck load is removed from the rear, another unbaked load is pushed through the entrance door. Besides the heat-circulating fan in each compartment, there is an exhaust fan to remove flammable solvent vapors. This exhaust also serves as a safety purge in the oven-lighting cycle. Complete safety devices are provided for auto-

Two banks of 3-lamp explosion-proof fluorescent fixtures provide 40 ft candles in each booth. Wire glass windows separating fixtures from spray gun vapors provide a smooth, easily cleaned surface



Explosion-proof motor starters and circuit breakers, switches and junction Condulets energize and protect the electrical circuits of pump motors used to drive 750 gpm of water through the spray curtains of each booth

dividends

RALPH HOPKINS, ass't plant engineer, CROUSE-HINDS CO, SYRACUSE, NY

matic gas shutoff in case of failure of the pilot or fans.

To supply adequate makeup air and to maintain positive pressure in the painting area, four air-replacement units are installed on the roof. Thus placed, and without requiring space in the production room, they supply about 90,000 cfm of filtered, tempered air to the department. Regardless of cold weather, proper temperature of the incoming air is insured by a Johnson pneumatic-control system. Primary filters of the units, for economical maintenance, are washable.

By using four separate air supply units it is possible to balance the air intake and exhaust when some of the spray booths are not in operation. Maintenance of individual units also is permitted without a shutdown of the air-supply system.

All makeup air is forced downward into a large plenum 48x8x4 ft, located next to the ceiling above the inspection area. From this plenum, air is delivered through disposable secondary filters along the ceiling. Because a large volume of air enters the room at a relatively slow speed, air replacement takes place with complete comfort.

The National Electrical Code generally defines hazardous finishing areas to be: the interior of spray booths and their exhaust ducts; all space within 20 ft horizontally in any direction from spraying operations more extensive than touchup spraying and not conducted within spray booths, all space within 20 ft horizontally in any direction from a spray booth's open side or from dip tanks or their drainboards; and all other spaces where hazardous concentrations of flammable vapors are likely to occur.

Consequently, Crouse-Hinds explosion-proof lighting and other electrical equipment is used extensively throughout the enamel and cleaning department.

Lighting, for example, was engineered to provide adequate illumination of spray booth interiors, storage, inspection, and cooling areas. Seventeen 300-w explosion-proof incandescent fixtures deliver 35 foot candles over the dip tank section and 22 of the same type EVA fixtures illuminate the general work area with 25 foot candles.

The inspection area, interiors of water spray booths and the furniture refinishing room are equipped with explosion-proof fluorescent fixtures that provide 35 to 40 foot candles. In the paint-storage room—also defined as a hazardous location by NEC—four explosion-proof incandescent fixtures provide 35 foot candles.

In addition, explosion-proof motor starters and circuit breakers, tumbler switches, junction Condulets, pushbutton stations and sealing Condulets were used to shield flammable paint solvents in the air from electrical arcs or sparks.

Although the flow of materials has become more and more complex, the new department continues to outstrip the production capacity of the old shop. For instance, "cocooning" flexible explosion-proof connectors and lighting-fixture supports with an anticorrosion envelope consumes a weekly quantity of 70 gal of vinyl per week, and 28 different production colors are applied to a multiplicity of castings from a fraction of an ounce up to 60 lb.

But new production records aren't the only achievements. Because its engineering features are so much better, it offers better working conditions and more convenience and safety, resulting in high employee morale and greater efficiency.

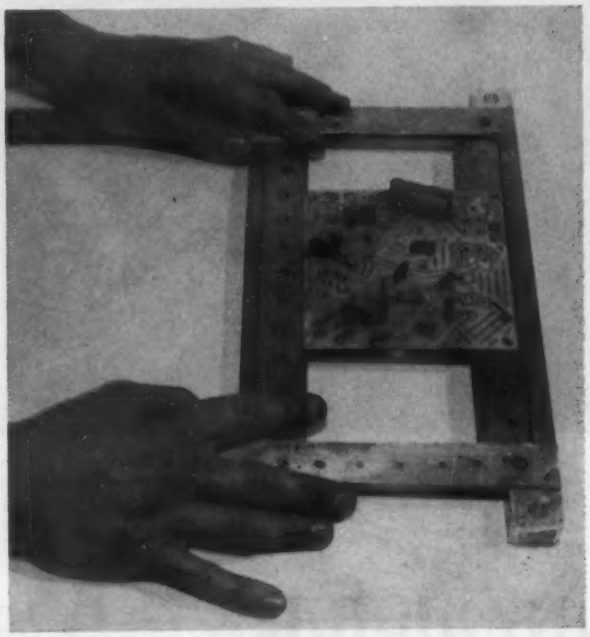
How radio builders are

Printed circuits came in just a few years ago, but already they've made a tremendous impact on the electronics industry. Most important, PC's make possible new assembly-line techniques that just couldn't be worked out with old-style metal box chassis and point-to-point wiring. Here's a round-up of present and future methods in this specialized field, digested from the September issue of our sister publication, Electronics . . .

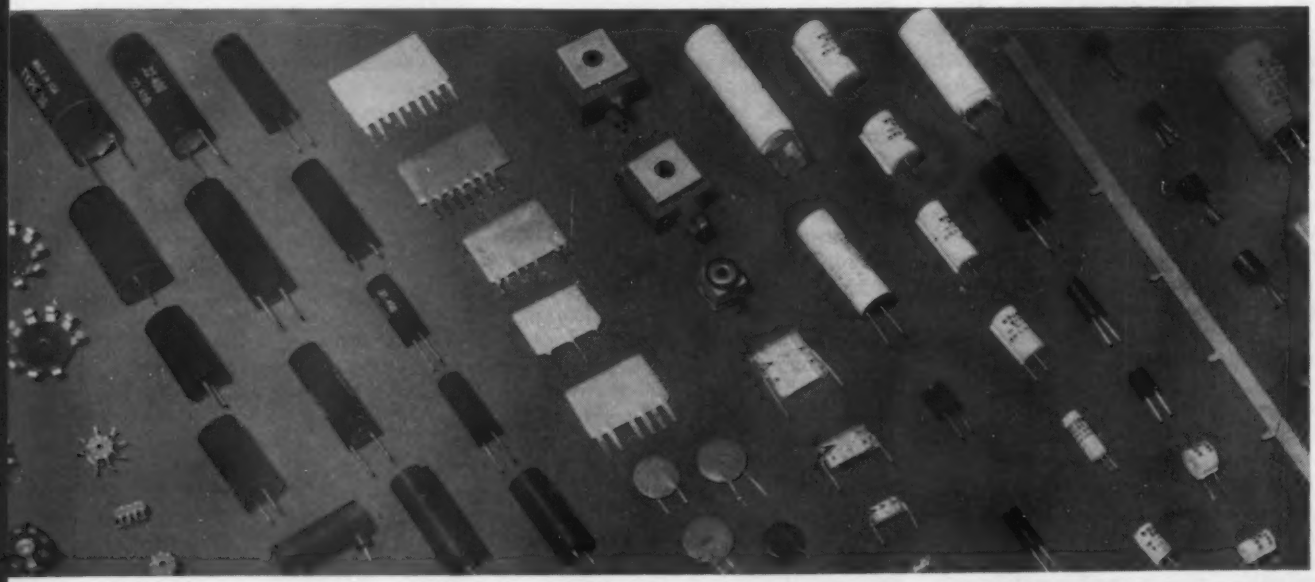
Why PC Boards?

Printed-circuit boards are a boon to the electronics industry for many reasons. They are light, strong, and flat; they can easily be stored, fed from magazines, and moved along conveyors. They have high reliability; that is, quality control with PC boards is easier and more effective than with hand wiring, and it's more likely that all parts will be placed right, and that all wiring will be correct. PC boards have proven in field tests to be better able to take a beating than hand-wired circuits.

There are drawbacks, too. Most PC circuits are made on small boards, because if the holes are made with multiple punches, the punches strip poorly and are apt to break up the boards. Some radio and tv parts induce damaging currents in others, too, and PC boards don't have the shielding ability that old-style metal chassis have. But in radio circuits this is a minor problem, and in high-frequency assemblies, like tv, parts can usually be placed with care, away from each other, to eliminate real trouble.



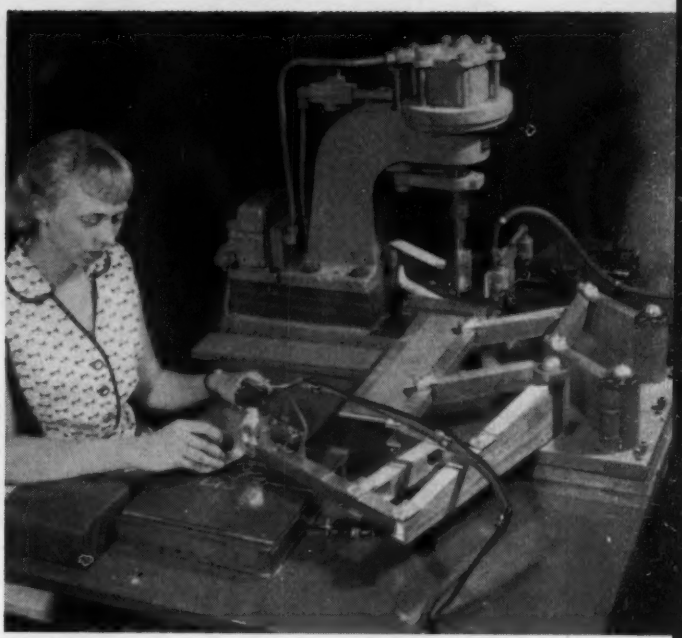
PRINTED CIRCUIT IS A FLAT BOARD with two-dimensional wiring; all components are attached to eyelet or prong terminals. Point-to-point wiring, where the small parts themselves made up most of the wiring network, is out the window. PC board here is on a GE conveyor pallet that carried it while small components were placed



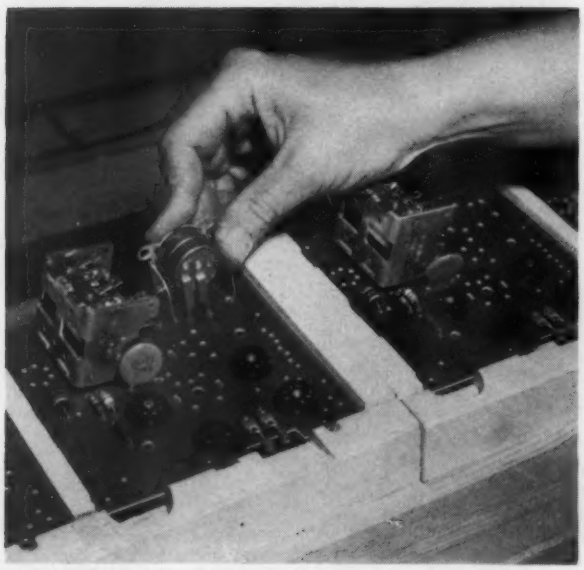
NEW LOOK IN COMPONENTS isn't much different from old, so far. Most of these have been redesigned so all terminals come out one side or end, allowing magazine feed, and simplifying assembly to one side of the PC board. Components are tube sockets with flat terminals that will solder right against the plated wiring on a board, bypass capacitors with both leads out of the same end, small sealed printed circuits with tab terminals, dry-disk rectifiers with tab terminals, and more capacitors

approaching automatic assembly

PC BOARD STARTS WITH NETWORK LAYOUT, which is partly mechanized at Photocircuits Corp. Master board is aluminum, and has holes drilled in regular pattern to accept black Brady disks, which represent terminal points. Black tape is stripped between them to indicate conductor lines; then master is photographed



ETCHED BOARDS ARE PUNCHED in semi-automatic pantograph press, when operator makes stylus follow network lines in grooved master plate. Stylus drops into hole at each terminal point, actuating press which punches PC board. This is a Stromberg-Carlson machine; other methods are multiple punching, turret punching, and various drilling setups



HAND ASSEMBLY IS STILL NECESSARY for bulky parts, like this volume control being placed next to a tuning condenser at Westinghouse. Two terminals at edge of board were staked. Plated-etched wiring can be on two sides, or—as the case here—on one side only

PC boards are the starting point . . .

because they reduce the usual jumbled mess inside a radio or tv chassis from three dimensions to two. They're made this way:

First, a layout or drawing of the necessary network circuit that will join the components (resistors, tube sockets, capacitors, and other electronic parts) is made, then photographed. A silk or stainless-steel screen (200 mesh) is made from the photo. Meantime, a flat board of phenolic plastic has been copper-plated, and the screen is used to deposit the network pattern in acid-resisting wax on the plate. After an acid bath, which doesn't damage the plastic, the excess copper is eaten away, and a copper-plate network remains on the board.

Now the board is drilled or punched where holes are required, and the individual components are added by hand or machine. Finally the board is touched to the surface of a solder pot, which solders terminals of the components to the copper circuit. This process has many variations, but these are the essentials.

PLEASE TURN PAGE ▶

AUTOMATIC TERMINAL INSERTER at Admiral Corp, made by Malco, sets snap-in pin terminals into PC boards at first station. Reel feeds down strip of formed, but not separated, pins. Dies clip pins off, and white plastic tubes feed pins down to predrilled holes in PC board on table. Bottom ends of plastic tubes are held in jig board, made for each new setup. Press at next station forces terminals through board, where they are held by self-locking feature. Other stations add other small parts

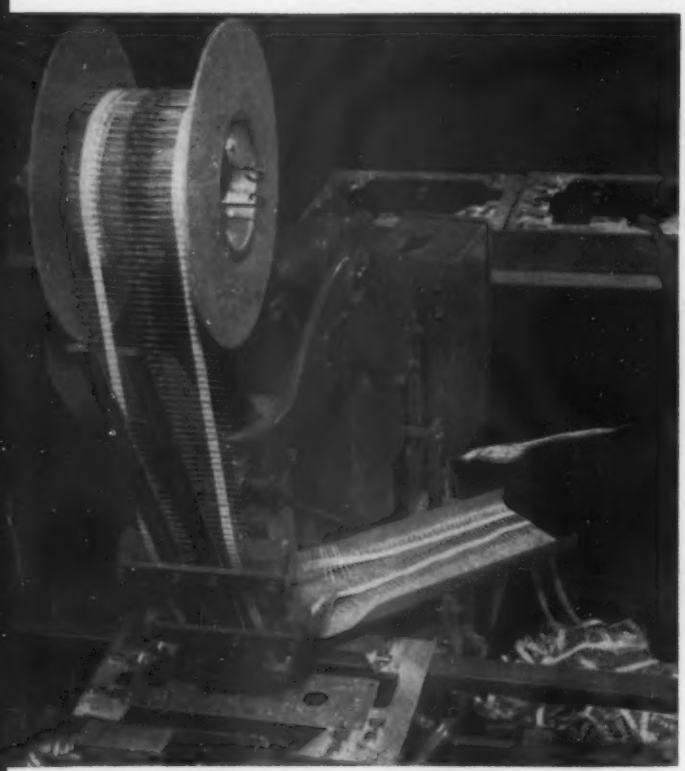
Components are placed on boards . . .

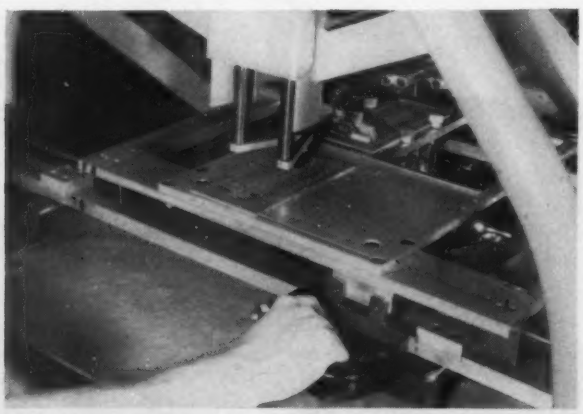
by heads with mechanical fingers that push the clipped and bent component leads into eyelet terminals that have been staked or riveted into holes in the boards. Some devices have wipers under the boards to bend the leads so they can't jiggle out; other machines rely on gravity to hold the components in place until they're soldered. In some cases, pin terminals that extend above and below the boards are added so other components can be wired in later—by hand or by mechanical wire-wrapping tools. But eyelet terminals are most common.

Feeding the parts to the working end of each inserting head is the tough job. Components are not standard within the industry, with the possible exception of common ½-watt carbon resistors. These are usually the same size and shape from all manufacturers, but capacitors, tube sockets, and other parts vary all over the lot. As a result, there's going to be plenty of special orders, and extra work in assembly.

The ½-watt resistors can be mechanically reeled up with tape, which may be attached to the bodies, or to the pigtail leads, and fed to the insertion heads from the tape. If so, the head usually clips off extra wire from each lead, disposing of the tape at the same time, if it's along the leads. Other parts can be magazine fed—many of the redesigned parts illustrated are ideal for magazine feed.

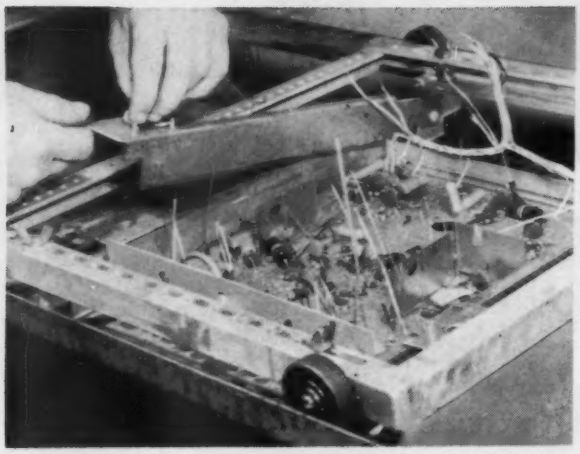
There's always hand assembly for larger parts, and even though hand work is slower, the advantages of printed circuits aren't lost.





SINGLE-STATION MACHINE is built for versatility—can place any number of different parts on same PC boards, which are run through again and again, each time for a different component. This one at GE is manually operated; others can be tape controlled. Main use is for short batches, such as test instruments

INLINE MACHINE uses many placement heads like this at RCA, each head inserting one component endlessly in PC boards as they are indexed past on conveyor rails. Machine is built by United Shoe Machine; used also at Emerson. Taped resistors (or capacitors) feed from reel; head clips excess leads (and tape) away, bends remaining leads, and inserts component in PC board automatically



SOLDER "RAILROAD" at DuMont has trolley cars into which PC boards are locked before solder dipping. Trolley runs to solder pot, then pot is raised so solder level touches plastic board. Solder tins all exposed metal surfaces, and fills in eyelet terminals through which leads from components have been assembled. Solder doesn't stick to plastic, so it doesn't short out any of the plated-and-etched network lines

SOLDERING STATION at Westinghouse has indexing turret with four arms and open-bottom frames that carry PC boards, which are dipped in flux, dried, dipped in solder, and dried again. This is semi-automatic; requires hand loading and unloading, but depth of solder dip and timing are set for automatic repeat

AUTOMATIC TV ASSEMBLY LINE at Admiral Corp inserts 70% of the 231 electrical parts for one tv model into 3 PC boards. Wire jumpers, resistors, capacitors, and tube sockets are handled automatically. Operators keep magazines full and do some hand work that can't, as yet, be avoided. Line replaces 400 hand-soldering jobs formerly needed

Dip soldering is a big advantage . . . and even if assembly is by hand, printed circuits that can be dip soldered can be produced faster and with much less factory space than can old-style box-chassis products. When most or all of the parts are in place on one side of the PC board, the board is touched to the surface of a solder pot (after fluxing), where the eyelets all pick up solder that holds the component leads firmly in place. If there is copper-plated wiring on the underside, the solder doesn't short it out because solder doesn't stick to the bare plastic board.

The key to mechanization in the electronics industry is flexibility, for it would be easy to overproduce a standard circuit, once a line was set up. Maximum flexibility is obtained with the single-station machine, and for lots under 50 pc, it's fastest and most accurate. But single-station machines aren't for mass production, and will probably only be utilized for special projects.

Inline machines with many inserting heads are designed for fast production for long periods; yet are flexible, too. One company thinks it can make a complete setup change in the line, so it will produce an entirely different PC board, during the plant lunch hour. It's done by replacing individual inserting heads, and sending through PC boards with a different circuit.

PRODUCTIVITY

T F DAVENEY

"I BEG your pardon," said the little man in horn-rimmed glasses, "but I'm a member of the productivity team that's touring this factory. Would you mind telling me about your job?"

"A pleasure," I said. "I'm what they call a checker. I check these little balls for size. I put them on this frame and all those that fall through the holes are too small."

"I see," he said. "And what about those that stay on top?"

"They're too large," I said.

He sucked his pencil and frowned. "But they either go through or they don't."

I nodded.

"Then all these balls are too large or too small."

"Yes," I said. "It seems a waste, I know, but that's how it's been since I came here eight years ago."

He made a note in a little book he was carrying. I thought it was about time someone reported it.

"Have you any idea where these little balls came from?" he asked.

I thought for a bit. "Alf here on my right brings them to me."

"Where does Alf get them from?"

"Half a mo'," I said. "You can't expect me to know *all* the ins and outs."

"Perhaps you know what happens to them after you've checked them."

"Yes, I do," I said. "Fred here on my left takes them away on a trolley."

"Where to?" he asked.

"Why ask me?" I said. "It's Fred's job, not mine. I suppose they all go to waste. Where else would they go?"

He came round beside me.

"Watch out," I said. "You're holding up production."

"I'm sorry," he answered. "That's the last thing I want to do. I wonder, do you ever get depressed at the thought that all these little balls you check go to waste?"

"You never know," I said. "You might get one the right size."

"How?" he asked.

"Never mind how," I told him. "You might. It stands to reason. Otherwise I'm wasting my time."

He watched me check for a few minutes.

"Do you know what these little balls are for?"

"Know what they're for?" I said. "They can't be for anything. They're all too big or too little."

"I grant you that," he went on. "But too big or too litle *for what?*"

"For going through the holes," I said.

He seemed to get agitated. "Do you like what you're doing?"

"It's very interesting," I said.

"You wouldn't like to change your job?"

"I'm a trained checker," I told him, "and you don't get anywhere by chopping and changing."

"What do you think about when you're checking?" he asked.

"I think about my work mostly," I replied, "except when people ask me questions; then I'm liable to make mistakes."

"I'm sorry if I'm making you lose concentration," he said. "But what other things do you think of?"

I said I sometimes wondered what would happen if I got a ball the right size. They had never told me about that. I suppose I should give it back to Fred; then it would be his pigeon.

He said I oughtn't to let things like that worry me. I told him it was easy to give advice.

He put his little book away. "Thank you for giving me all this information. I shall find it very useful."

"Don't mention it," I said. "If there's any side of checking you're not sure about, just let me know."

"I shan't hesitate," he replied, "but for the moment the broad principles will suffice." He turned to move off.

"There's just one thing before you go," I said. "We're short of something here that the other sections have got, and I think we ought to have it."

"What's that?" he asked.

"A production target," I said. "A big chart with a sliding hand fixed up on the wall will give us all a lot of encouragement."

"I'll see what I can do," he said.

I rubbed my hands. "Good. You've no idea what this'll do for production."

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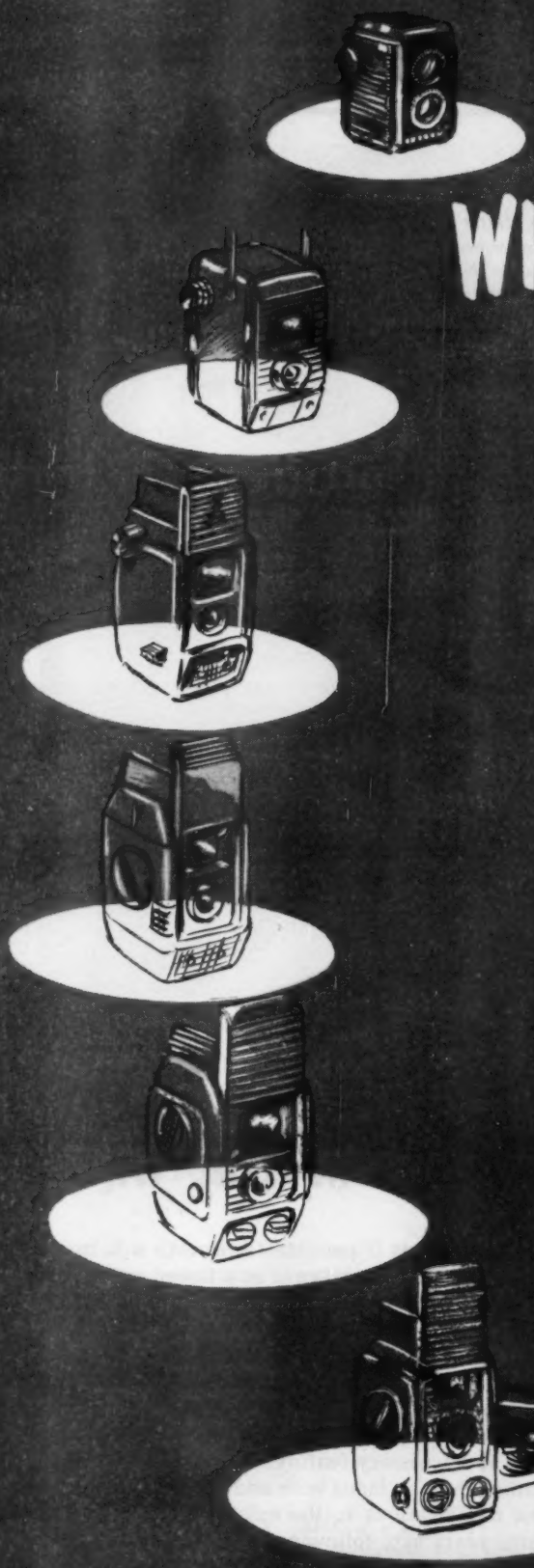
American Machinist
SPECIAL REPORT NUMBER 404



When you redesign...

RETOOL FOR ECONOMY AND QUALITY

Whenever you plan to restyle an old product or design a new one, manufacturing methods are an important part of the program. Will available facilities limit the extent of restyling? Are the new design features so important to sales that entirely new facilities are warranted? Can restyling include all of the necessary improvements and permit producing the product at a lower cost? Is the new design practical for manufacturing? These, and many other questions must be answered, regardless of the product.

Here is an outstanding case history that will help you by showing how one company planned. And, even if you aren't planning a new product, it will give you a variety of useful manufacturing ideas.

With its Anscoflex camera, Ansco has introduced a new, award-winning, concept of box-camera design that includes many improvements not previously available on cameras selling in this price range. First, the entire outer housing is aluminum alloy, finished in smooth, scratch-resistant enamel. The inner body is only two pieces, injection molded from a thermoplastic having good impact strength and high-temperature stability. Camera details include built-in filter and close-up lens; built-in wipe-action flash synchronizer; full-size-image reflex view finder and a device to prevent double exposures.

Designed by Ansco with the styling assistance of Raymond Loewy Associates, the Anscoflex is produced at a 3000-per-day rate. New tooling and equipment for this line total more than $300,000.

As told to Wm M STOCKER, JR, associate editor, by . . .
LEONARD E CIRINGIONE, plant manager
ROBERT C SCUDDER, mgr, manufacturing engineering
CARL ZICK, methods supervisor
Camera Plant, Ansco Division
GENERAL ANILINE & FILM CORP, BINGHAMTON, NY

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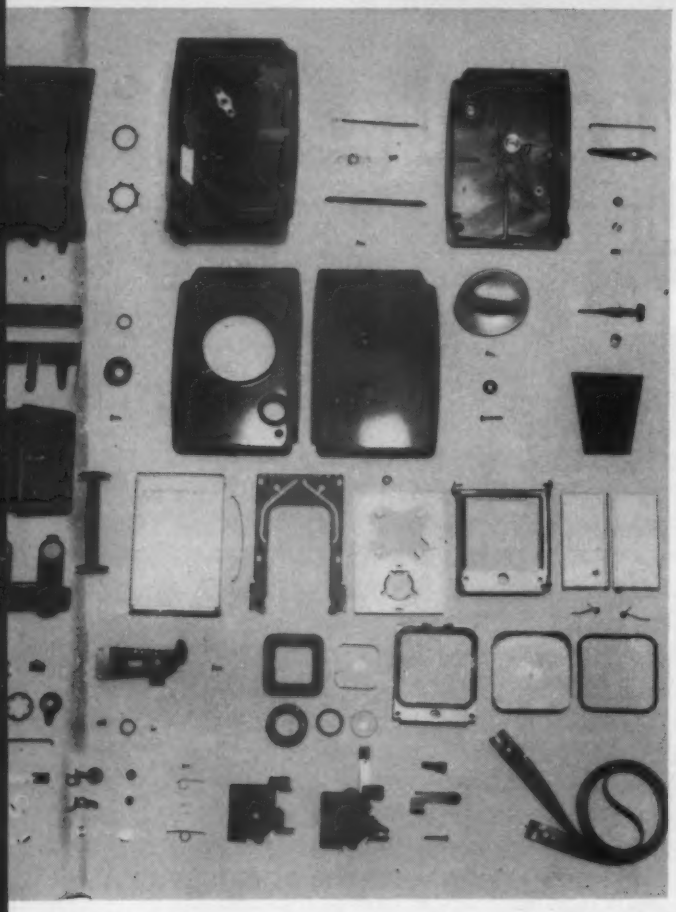
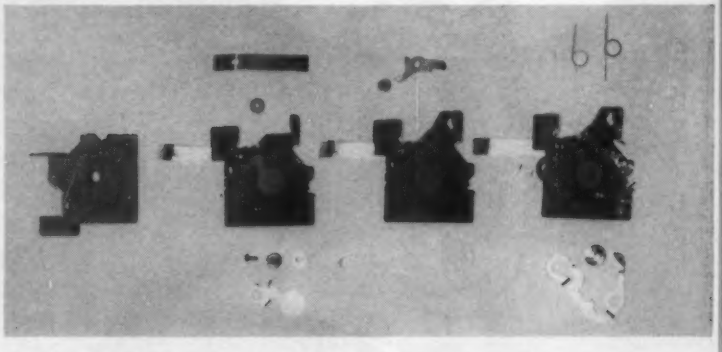


More than 100 parts . . .
and sub-assemblies comprise the Anscoflex II camera. Other than the lenses, the two plastic body parts, and the shoulder strap, all parts are metal—aluminum and steel. This camera retails for less than $20, hence every operation is critical and very little production waste can be tolerated

Shutter and synchronizer assembly . . .
is built up from stamped parts; is an Ansco adaptation of a standard box-camera shutter. Synchronizer operates by a wipe action across the insulated "button," which is said to provide more positive synchronization than a make-and-hold switch. However, this device is more difficult to produce and each unit must be tested and adjusted for proper action (normally only about 10-15% require adjustment)



CONCEPT AND DEVELOPMENT:

functional styling at a

Through the years, very few major style changes have been made in the camera field, especially in popular-priced cameras. They have assumed somewhat standardized forms, according to type, but little thought was given to their styling or, especially, to provide a style that would highlight their specific functions. This condition is true for many other products, in addition to cameras, particularly when consumer demand is high for the present model and there is no pressure to change.

However, there are many very sound reasons why a change to functional styling is desirable, though some of them are not readily apparent. First, there is the factor of consumer interest in a new and modern style, hence a competitive advantage, when most of the manufacturers are marketing similar conventional products in the same price range. Then there is the productive advantage obtained by designing the product for more efficient manufacturing techniques. Here it is possible to provide a better-quality product and to make it at a lower unit cost. The analysis necessary to thoroughly restyle a product is almost certain to engender many good ideas as to how the new style should be made; ideas that do not ordinarily develop in the routine of conventional practice.

Still another advantage is the ability to include auxiliary and accessory features as parts of the basic unit, rather than be faced with adding them as cumbersome modifications to the existing model.

Several years ago, following this reasoning, General Aniline & Film Corp obtained the services of Loewy Associates, stylists and designers in many fields, to assist it in designing its packaging, its trademark, and its products to enhance beauty and consumer appeal, as well as to capitalize on the functional characteristics of the products developed. The most promising of the various products to fully de-

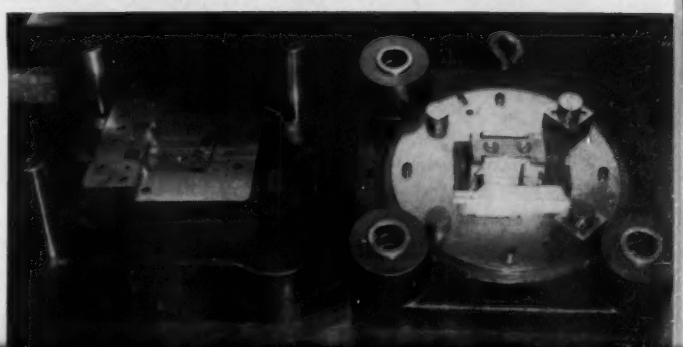
Die-storage vault . . .
contains all of the dies for Ansco cameras. Dies are carefully cleaned and coated with rust preventive, when they are not needed, then stored by tool number until the next order comes through. Old dies frequently serve either as a guide to the development of new dies or can be used in the construction of new dies, the latter when they become obsolete. Vault is fireproof, explosion proof, and has controlled humidity

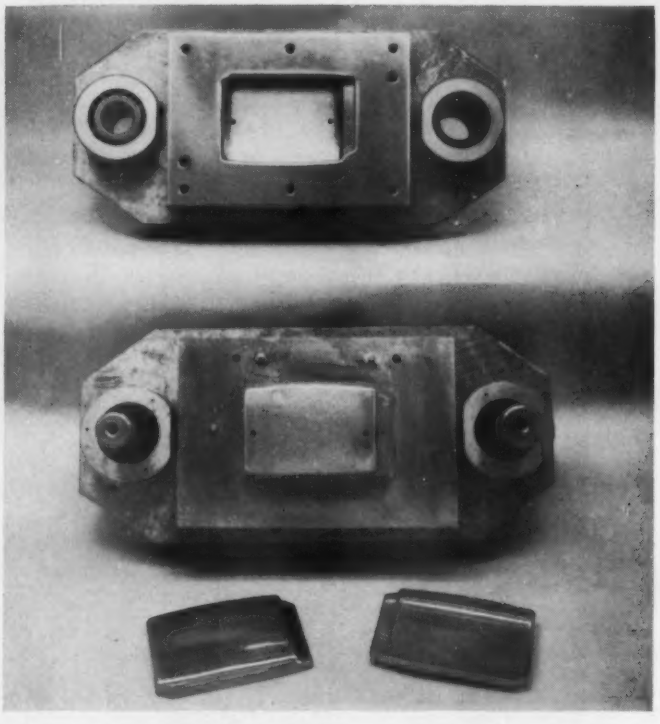
popular price

velop this theme is the "box" camera which has direct mass-consumer appeal. Cameras are among the many products made by General Aniline at its Ansco Division.

The Anscoflex was designed to be produced and sold at a reasonable profit, thus manufacturing cost was a very important part of the program, especially as the product had to be sold within a limited price

Brehm "Shimmy" die . . .
(The Steel Products Engineering Co, Springfield, Ohio) trims, in one stroke, parts to three heights of irregular contour. As punch descends, pressure pads support the part while cam-actuated cutter-slides move in to provide the desired trim. Die is shown trimming back cover; is used in a 50-ton Dennison hydraulic press, with a 10-ton air cushion. Nest is plastic, cast right in the part and then mounted in the die, to prevent marring the surface of the part. Five dies trim all five major parts and production for this piece is 340 pc per hr





Draw die . . .

for side plate includes pinch-off design. Part is drawn in one stroke from 0.025-in.-thick 50S-0 aluminum blank. Then as punch bottoms, upper edge pinches off excess material, thus eliminates a separate trimming operation. Die is highly polished to prevent marring surface of work. After drawing, panel is set and pierced in a second die

range. However, because quality and functional versatility also were prime considerations, no cost cutting was permitted at their expense. All of the cost saving had to be concentrated in the producibility of design and in efficient manufacturing techniques. One advantage is that the high volume of orders for this camera type permits extensive tooling; another is that functional design lends itself to functional tooling.

Probably you have heard many people say, "Give me my box camera any day. I *know* that I'll get good pictures with *it!*" If you sport one of the more complex, and expensive, jobs, you most certainly have heard it. Actually, for the average person, untrained in photographic techniques and using a camera under average conditions, this type of camera is very practical. More interested in a pleasing photograph "for the record" than a masterpiece, his batting average may be higher.

The reflex box camera, which enables the photographer to view in full picture-negative size the image that will be obtained, in addition to the advantages of a simple fixed-focus lens and a synchronized shutter has, in terms of consumer demand, become one of the most popular types of easy-to-use cameras. Ansco's Rediflex was of this type; was introduced shortly after the end of World War II. Quickly accepted by the American market, it was an all-plastic camera with a double f:11 lens.

In 1950, Ansco decided to redesign the Rediflex to include:

1 . . Far-near focus on the taking lens
2 . . A double-exposure prevention device
3 . . Metal trim to enliven appearance
4 . . Use of plastic more resistant to heat
5 . . Modifications and improvements to existing features

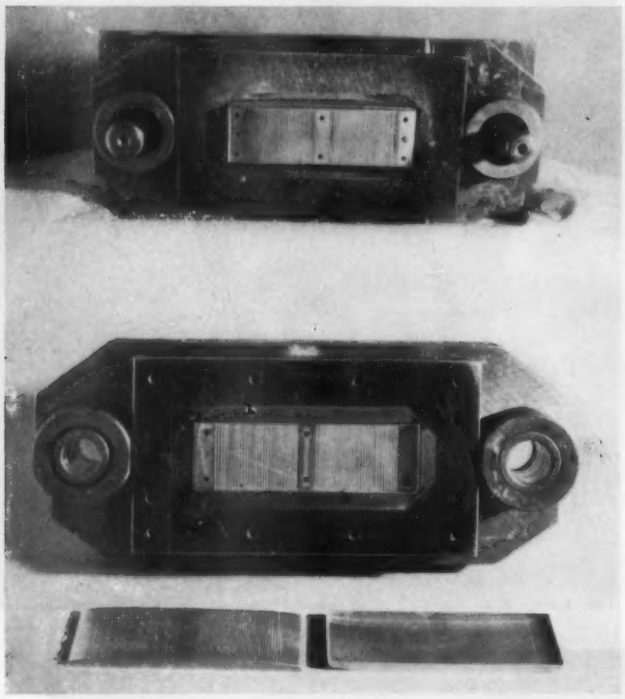
With these aims established, many preliminary meetings were held between Ansco designers and Loewy stylists to review and analyze the Rediflex to determine specific design elements. Several study sketches and drawings were prepared, including the modifications, to illustrate the new appearance. Meanwhile, several new ideas developed which were included in a basic elementary working model by the end of 1950. This model contained some radically different ideas, for a box camera:

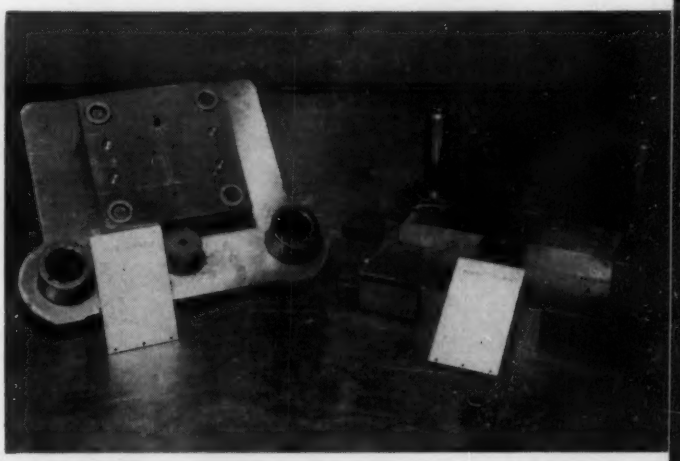
1 . . View-finder hood and sliding front cover, the latter to protect the lenses.
2 . . A reciprocating wind plus double-exposure prevention.
3 . . A film-spool support attached to the hinged back cover of the camera so that, on opening, it is totally accessible for loading.

From this model, and after further meetings and discussions with the Loewy personnel, it became apparent that the functions which were established dictated the styling, and in addition, that the styling which resulted was most attractive. It was only necessary to choose the right color to tie in with functional styling to achieve outstanding appearance. A wood mock-up model completed in the Spring of 1951 is amazingly close to the cameras now in manufacture. In this new shape, Ansco had developed a camera which was "streamlined"; it had no protrusions and all lines flowed pleasantly.

Out of the design requirements came a raft of new problems for in the melee of new ideas the old, all-plastic Rediflex was lost. Now the right appearance called for an all-metal outer shell. Cost factors plus a desire for reduced danger of breakage demanded a two-piece inner body of thermoplastic resin. The metal shell required an enamel finish that was the proper color, smooth, and mar resistant, as well as firmly and evenly attached to the surface with no danger of chipping or blistering. Double-exposure prevention called for precise tooling. All of these elements combined to create a major assembly problem.

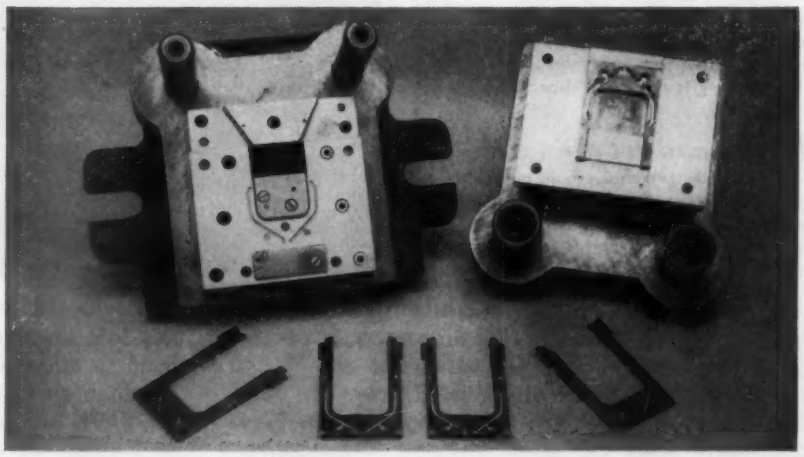
At this point began the time-consuming problems of detail design in which ideas on paper and from laboratory models had to be developed and trans-





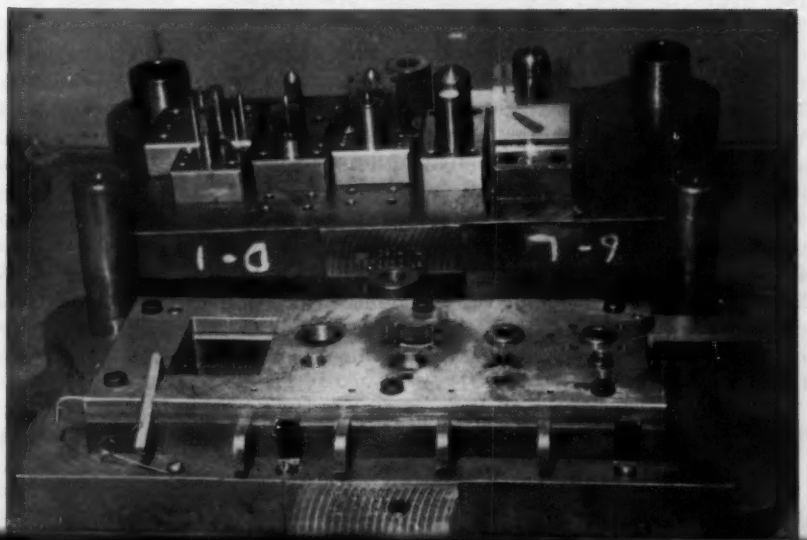
Double front panel . . .

is drawn, embossed, and punched in one stroke from 0.025-in.-thick 52S-H32 aluminum strip. Then a second die is used to separate the two pieces. Finally, a restrike die is used to square each piece because changes in the temper of the aluminum change the springback—and this is easier to correct with a simple, adjustable restrike operation. Most draw dies are treated with chromium plating. This provides a smoother draw and longer die life. It minimizes galling. Runs exceed 150,000 pc between sharpenings. 1½ hr per day of tool dressing is saved



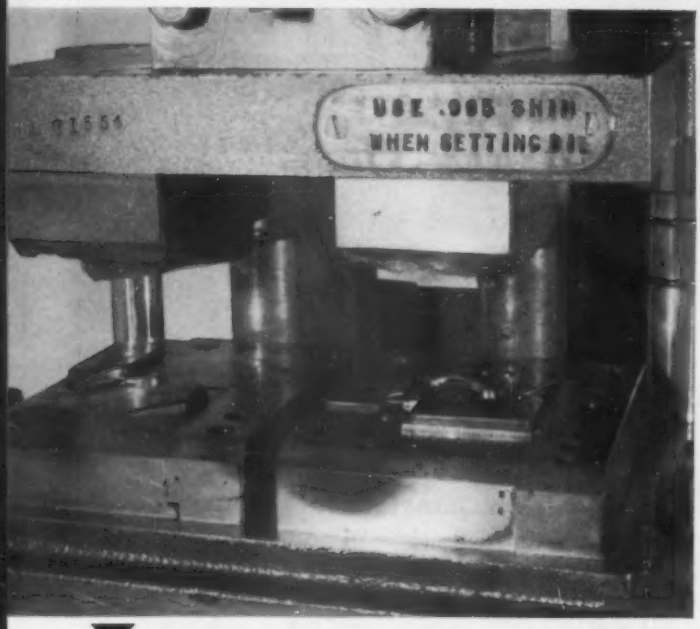
Cam slots, screw holes, and web . . .

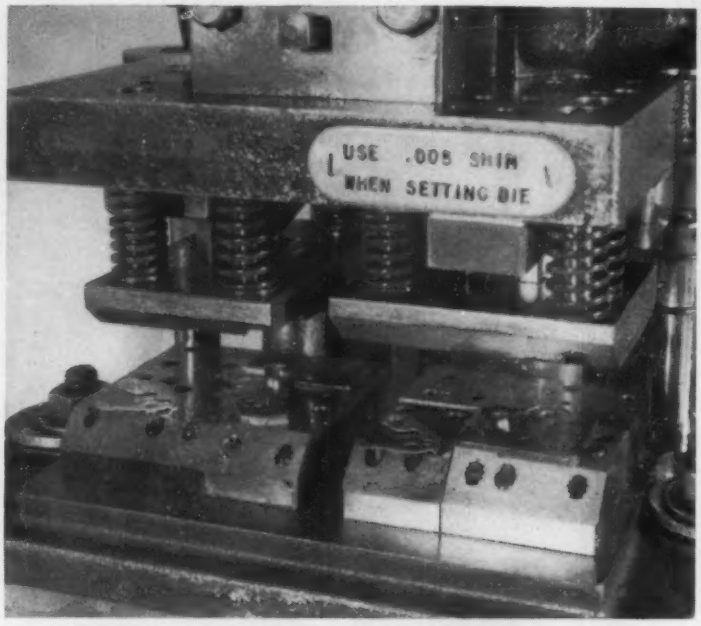
are pierced on a single die from 0.020-in. SAE 1010T3. This is after blanking, forming, and tumbling to minimize distortion in the cam slots



Texture plate . . .

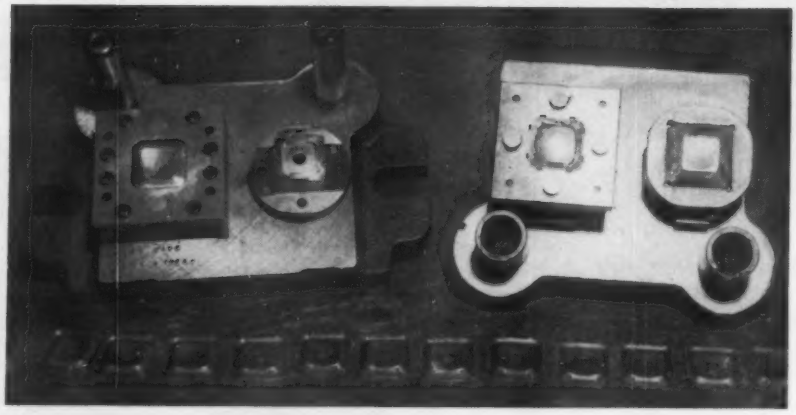
the front fixed panel which contains the lens mounts, is produced with this progressive die from textured steel stock. Die blanks, forms, and pierces at each stroke. Spring-wire at lower left should be under stock stop, which is held in position by screw on punch-holder until all punches are clear. Then spring depresses stop to allow stock to advance





Shutter trip lever . . .
is formed on one two-station die, then set and shaved on a second two-station die, the latter in the assembly dept. Part is made from 0.016 spring-temper brass. Part is held to tight tolerances to "build in" shutter speed and synchronization. Part is used immediately without inspection. Function of the assembly is the best "inspection"

Pierce and set die . . .
for front finder-lens frame both pierces the part and imparts a parabolic curve to its surface. This is done in two steps. After forming and piercing, part is held in upper die at left and coined



lated into production practicalities. Most of the production problems can be summarized as:

1.. A satisfactory injection-molded internal structure. Here, a two-part mold was prepared and developed with the cooperation of Consolidated Molded Products, Scranton, Penna. It took nearly two years to design and finalize into production.

2.. Intricately formed metal parts, especially for the exterior appearance which required special techniques in forming and trimming.

3.. Development of a satisfactory enamel finish for the exterior, plus finishing techniques for these and all other metal parts. This included automatic painting, barrel finishing, electrolytic surface treatment, and training employees in handling methods to avoid marring.

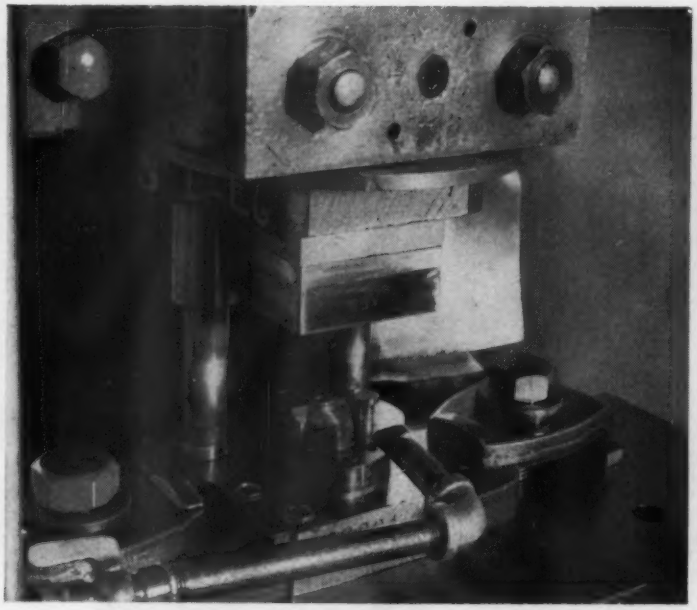
4.. Planning and organization of assembly methods. Special tools were developed to assemble on a production basis and flow was set up to feed components to sub-assembly to assembly to final assembly; then to inspection and packing.

5.. Because of the new design, extensive development in film transport mechanism was necessary to eliminate the usual style of pressure pad which supports the film as it travels from the loading spool to the take-up spool.

6.. Development of a flash unit to improve on previous flash unit concepts and to blend well (being molded plastic) in styling with, and in color to match, the camera.

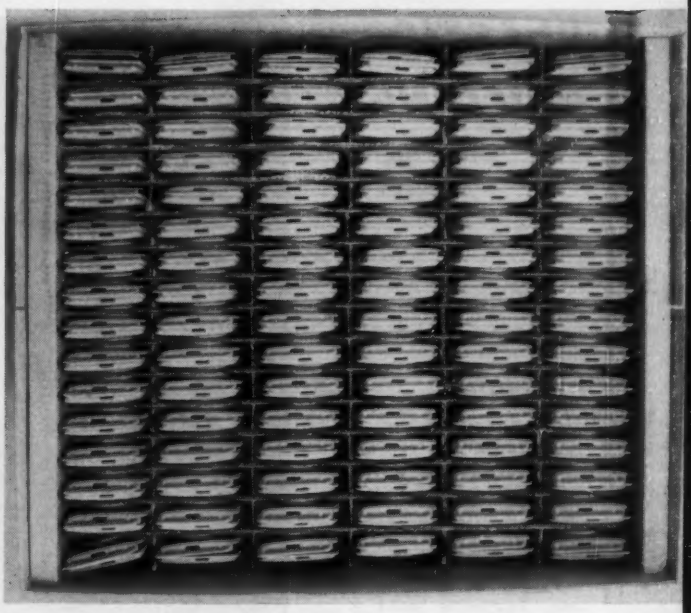
7.. Development of an economical double-lens system rather than the usual single-lens system common for cameras within this price range.

As the camera was being transformed from a design on paper to a workable product, several other ideas were incorporated, such as the hidden back catch, the removable lens panel, and the take-up spool ejector. About one year after this model was introduced to the public, a second model, the Anscoflex II, was developed. This model includes all of the other details plus a built-in yellow filter and a built-in closeup lens.



Forming and trimming . . .

spool drive-arm created a problem in separating the scrap from the parts as the dieblock was reground. To solve the problem, an adjustable chisel point was inserted into the die as shown. This cutter split the scrap so that it could be brushed off the table as it accumulated



Special cartons . . .

are designed to protect surface of parts while they are handled or stored between operations. Boxes cost about 75 cents, separators about 30 cents per box. Both may be used many times before they are disposed of and the saving in scrap caused by surface damage is considerable. Special training is given in careful handling to all new employees. When the project started, two meetings were held to explain the camera to all of the people who would be working on it. They were shown competitive cameras, told the details of the new design, and made aware of the importance of care in handling this new product

How the product is built

Because the camera design was new, some new manufacturing methods were called for; at least some methods new to this plant. The most difficult of the problems involved the inner plastic structure, to which many of the parts were attached. This plastic body required both good impact strength and high-temperature stability. In addition, for economy and high production, a unitized structure was necessary. After thoroughly reviewing the potentials of several plastics manufacturers, Ansco selected one that appeared to have the required skill and ability.

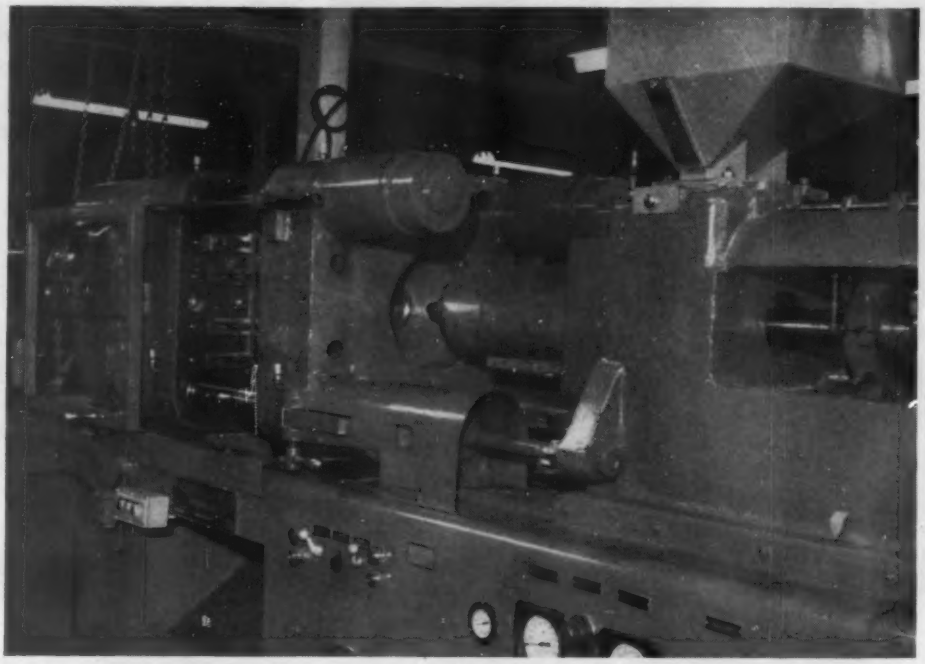
Means to trim five of the major external metal parts was the second most interesting problem. It was absolutely essential that these parts be clean and free of burrs as they had to fit without any possibility of light leaks. These parts were the side plates, the back, the light-lock shell, and the front panel. Normally, several operations might be required for multi-level trimming of the drawing.

Drawing on earlier, and much smaller scale, experience, Brehm "shimmy" dies were selected for the job. These dies are equipped with angular cams so that they cut four ways in one press stroke and handle straight, curved, notched, or projecting edges in a clean, flat trim; in one stroke.

Manufacturing problems were reduced by tooling that totalled more than $300,000. Even with a well-equipped shop, it was necessary to develop special equipment to meet some of the production requirements. In addition to more extensive use of hydraulic presses in both the press room and assembly, an automatic air-finishing and drying unit had to be developed to paint external parts properly. Because a smooth enamel finish was chosen in place of a fabric or leather covering material, it was necessary to have a paint that was resistant to abrasion, tough, and adhesive to metal parts. Ansco's own laboratory, working with a variety of paint companies, developed just such a paint with a uniform color range. It also was necessary to work with paint-spray equipment manufacturers to provide automatic equipment which would allow spraying with complete freedom from dirt and dust particles, as well as air bubbles, etc.

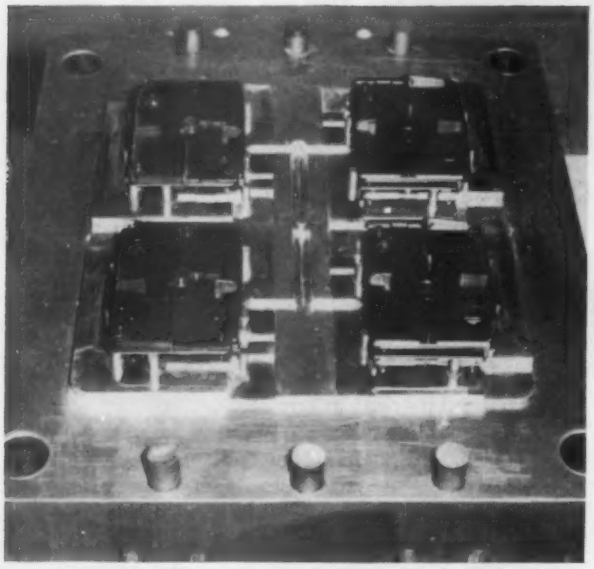
Further, aluminum stock had to be especially selected to be certain that it was free from blemishes,

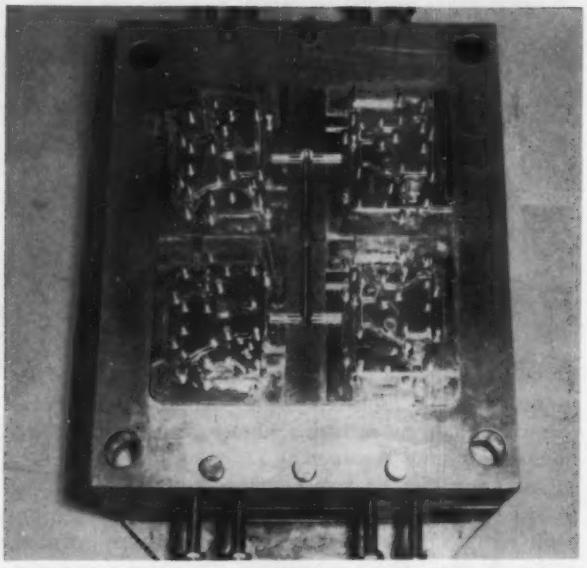
PLASTIC MOLDING



Injection press . . .

16-oz capacity, is at the plant of Consolidated Molded Products, Scranton, Penna, is hydraulically operated and is used to mold the right-side-body part from high-impact polystyrene. Four-cavity mold is water cooled. Production is 24 shots (96 parts) per hr





Cavity portion . . .

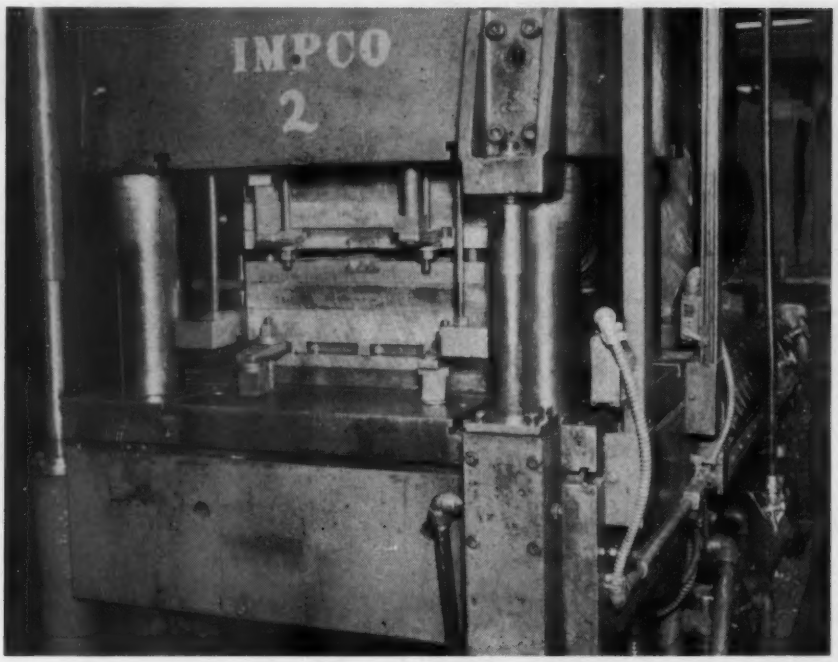
of right-side mold, with parts in position just prior to ejection. With parts removed, note the H-type sprue and gate in the center. The numerous ejection pins assure flatness and no distortion of part as it is removed from the mold. The four, short, threaded pipes are connected to the cold-water supply to rapidly cool the mold and minimize the cycle time

scratches, and other surface defects or damage.

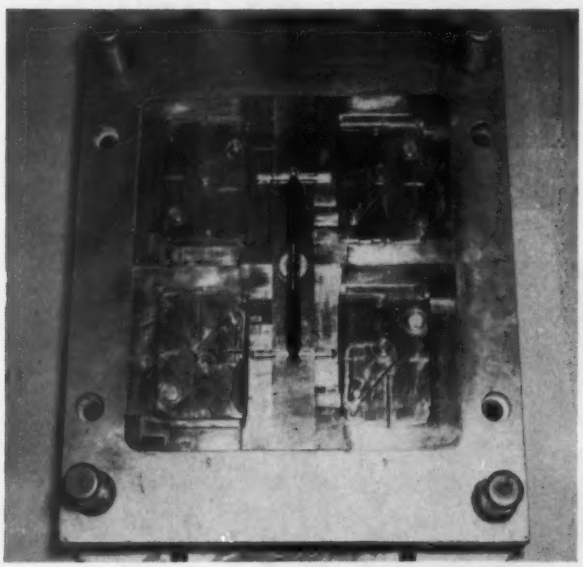
Employees had to be retrained in materials-handling practices because dented or seriously scratched exterior parts could not be reclaimed. In some areas, special tote trays were developed for handling the parts without damaging them. Many of the dies and assembly tools are a special composition of metal powder and plastic to prevent marring surfaces. Assembly operations are arranged in a flow system to minimize handling. Assembly tables have cushioned surfaces and plastic fixtures are used.

The assembly setup accomplished another benefit. It permitted greater control of quality by indicating problems in final assembly quickly enough to allow them to be corrected in the subassembly operation with minimum loss of parts and labor.

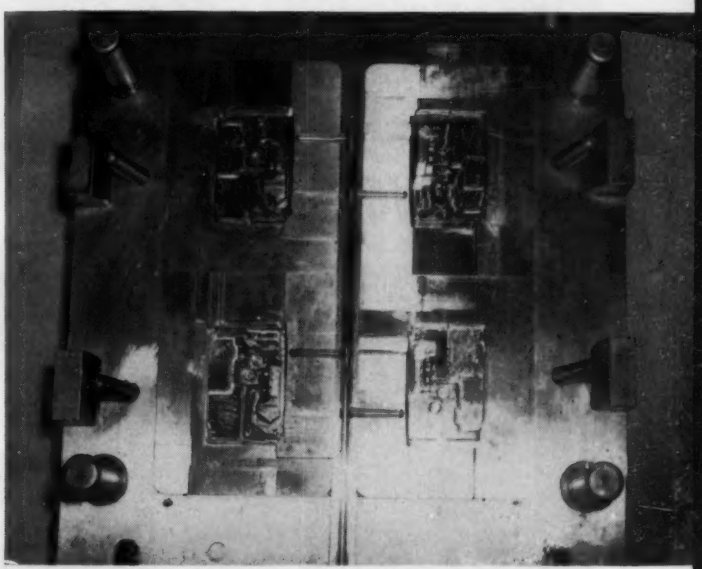
In the manufacture of this new camera, the pilot lot was handled in a somewhat different manner



28-oz vertical injection press . . .
is used to form the larger left-side-body parts. This press, too, works with a four-cavity, water-cooled mold. Production is 15 shots (60 parts) per hr



Force half . . .
of right-side mold is simpler than left side, however both molds are built up in hardened-steel ring sections. Ejectors are blade shaped and contoured to match the sections. To get some draws, sections must telescope with other platen

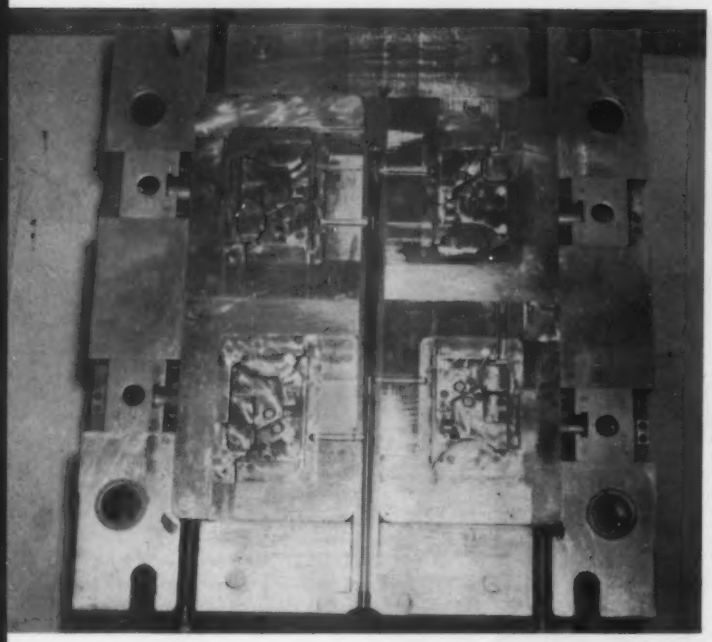


Force half . . .
of mold for body-left-side part. Sprue and gate are staggered, with the semi-liquid polystyrene injected from the lower-end-center of the mold. Because of the volume and the deep, thin cavities, this mold is used with a vertical press

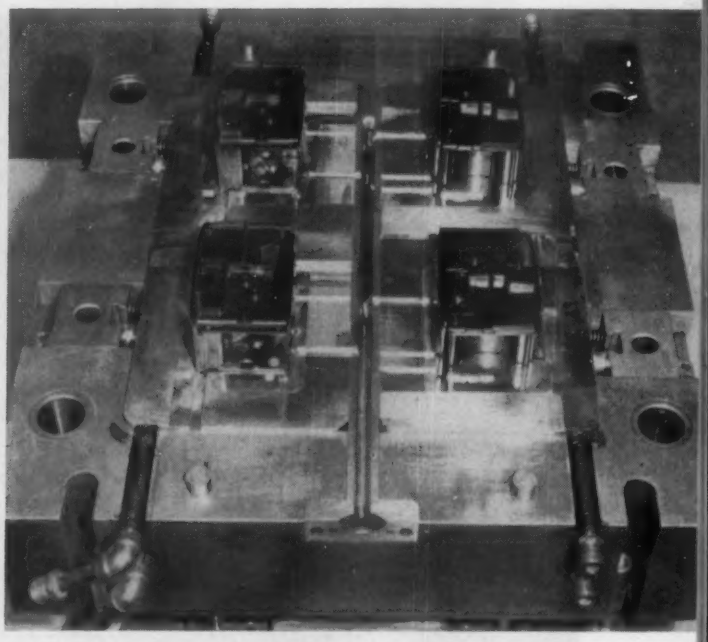
than for previous cameras. Parts were run under engineering supervision, with engineers actually perfoming assembly operations, and with greater than normal inspection. Where feasible, a frequency distribution was made on each dimension for at least 50 parts. After the necessary computations were made to determine the standard range of dimensions, this information was passed on to the Methods and Product Engineering groups. At this point, it was determined:

1 . . Where drawing tolerances could be revised.
2 . . Where tools had to be changed.
3 . . Where methods had to be improved.

Finally, tests were made on 350 cameras. All of the operating features were evaluated in breakdown tests, trial consumer reactions were obtained, and quantitative measurements of various of the operating features were made; then analyzed.

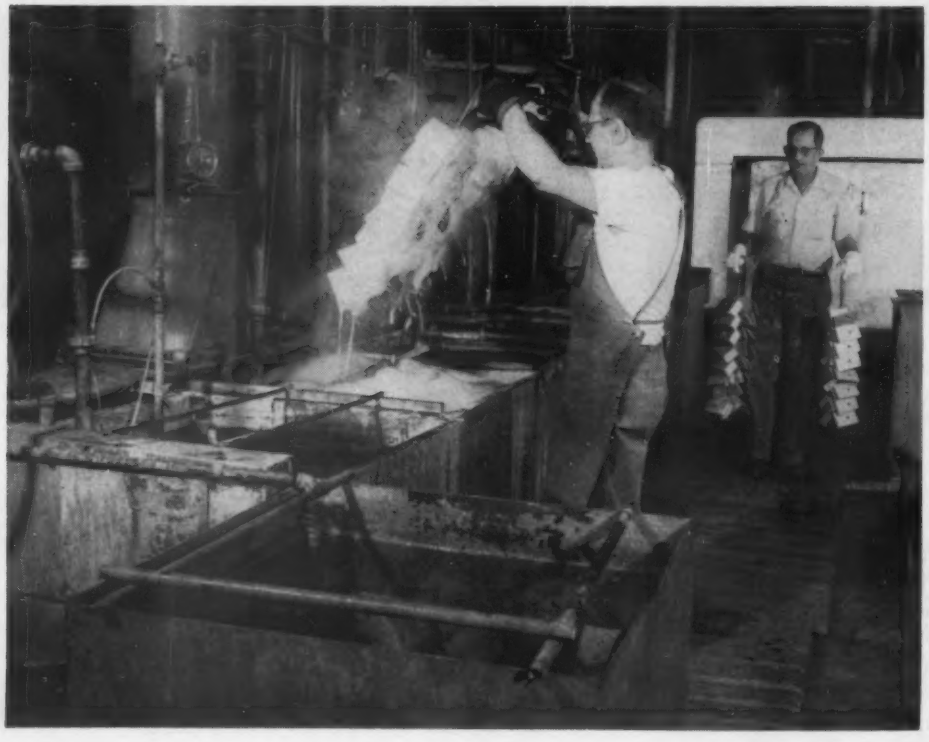


Cavity half . . .
of left-side mold. Each cavity is a distinct cell so that any one may be replaced or modified without affecting the others. Even the sprue and gate form a separate element to permit replacement without affecting the rest of the mold



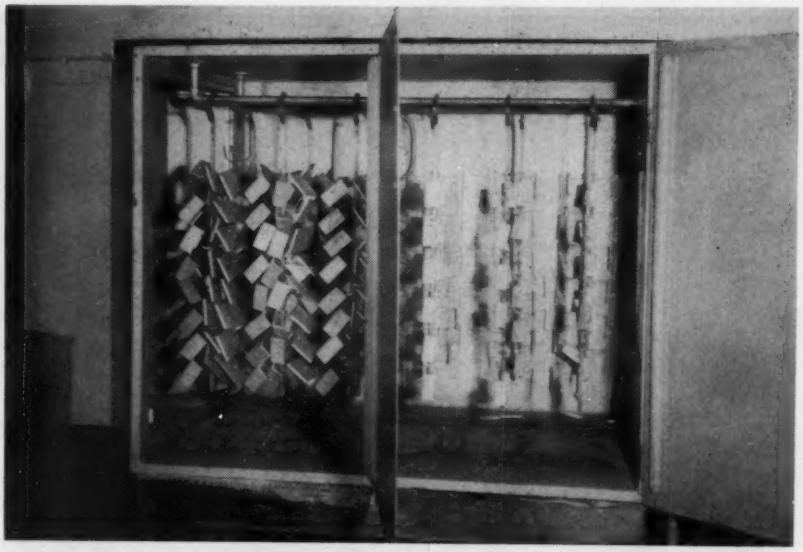
Four left-side parts . . .
partially ejected indicate the complexity of the mold and the depth of the thin sections that must be formed. This mold took two years to develop, but when the complexities of assembly can be built into a mold much of the recurring problem of manual assembly is eliminated. Formulation for this polystyrene provides photo-chemical inertness plus opacity

FINISHING



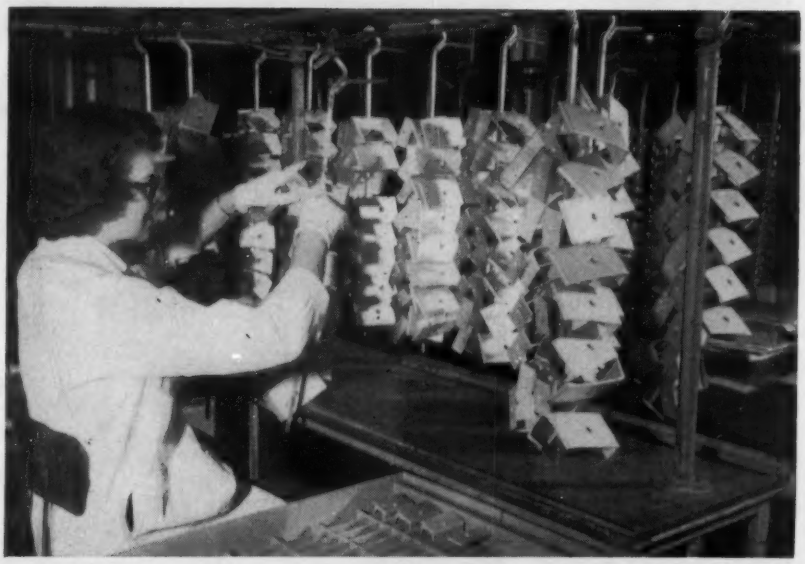
Iridite immersion . . .
is given all aluminum surfaces to be enameled to prepare them for holding the enamel more firmly. Operation shown here is alkaline rinse. Cycle includes:

1. Rack
2. Degrease
3. Alkaline clean
4. Cold-water rinse
5. Acid dip
6. Cold-water rinse
7. Iridite
8. Cold-water rinse
9. Warm-water rinse
10. Dry
11. Unrack



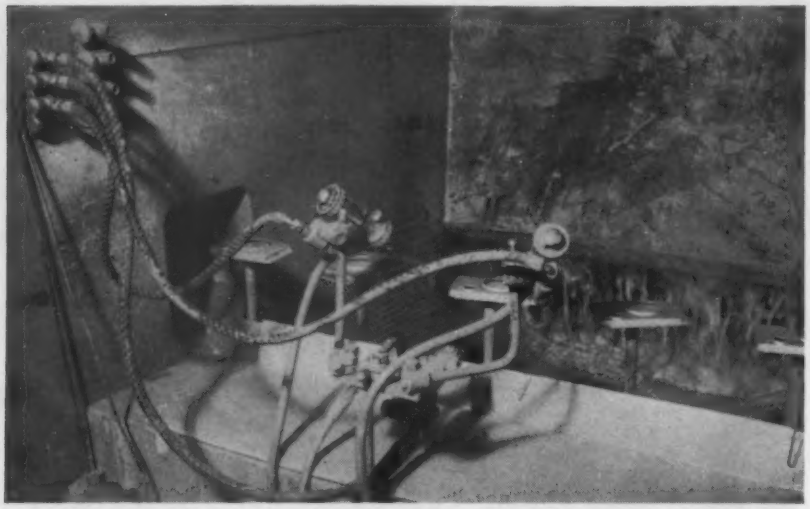
Drying oven . . .
is used in caustic-etch cycle for "Satin Metallic" finish:

1. Rack
2. Degrease
3. Alkaline etch 3½ min at 160-170 F in Ethone #14, mixed 2 oz/gal
4. Cold-water rinse
5. Acid dip
6. Cold-water rinse
7. Hot-water rinse
8. Dry in oven
9. Unrack

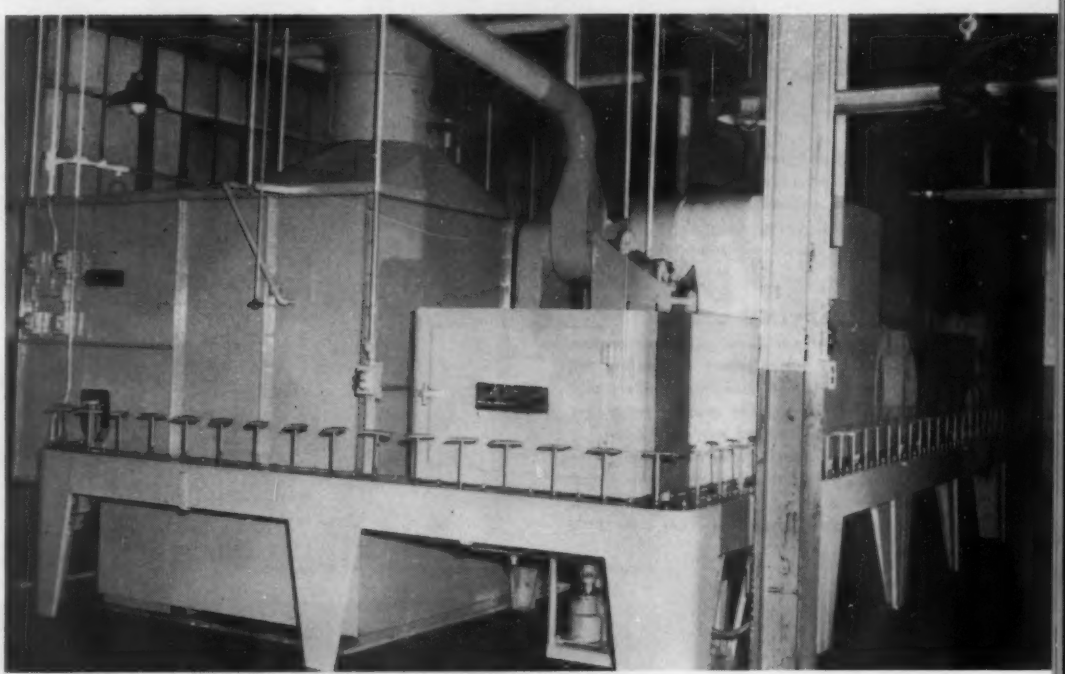


After drying . . .
Iridite-treated parts are placed in protective tote box for shipment to painting department. Note gloves on operator's hands. This is common practice wherever parts are handled, to minimize perspiration and oil marks which interfere with high quality finish. Similarly, great care is taken to keep the cleaning, painting, and assembly areas free from dirt, dust, and lint

On automatic paint-spraying machine . . .
parts are placed on specially shaped plates which are mounted on individual, rotating, spindles

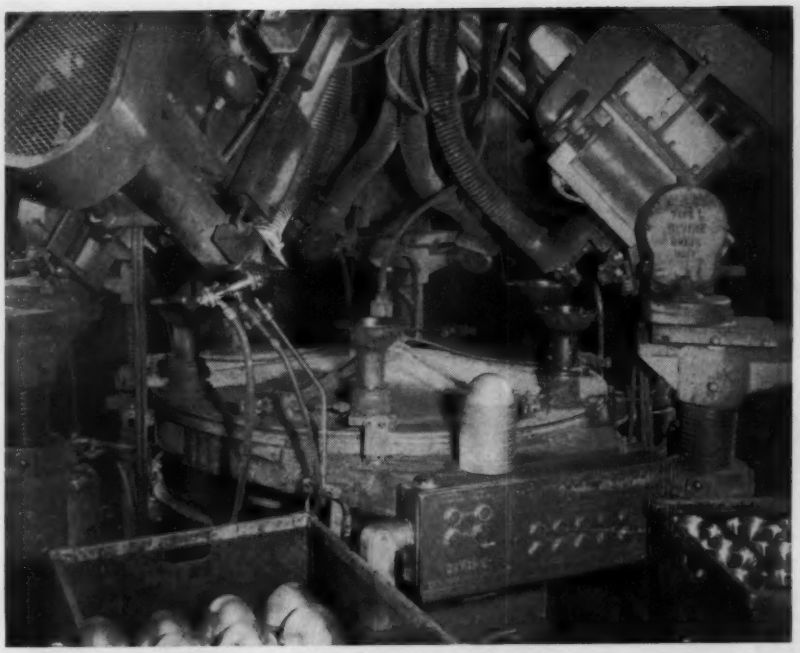


Twin spray guns . . . apply paint, which is urea alkyd melamine; is more durable than leather. As parts pass guns they are rotated to provide an even coat. Two or three guns and rotation are especially important on curved panels



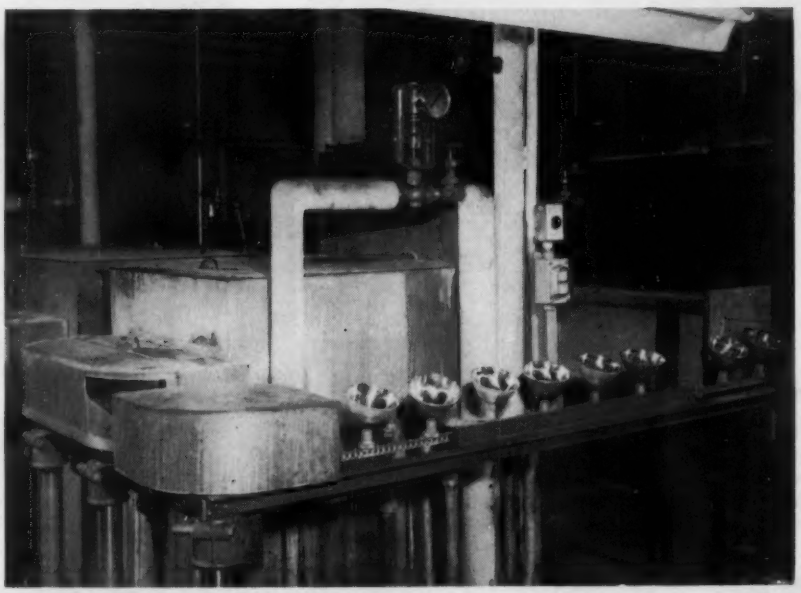
Automatic spraying . . . requires a sizable outfit. Machine contains 199 spindles and operates on a 6- to 7-min. cycle to paint 1500 pc per hr. It is hand loaded and unloaded. Here's the cycle: loading to prime coat (30 sec); prime coat; oven (110 sec); air cool (75 sec); finish coat; oven dry (3 min.); air cool (55 sec). Oven temperature is 290-310 F. Actually, hand operation —in bulk—would be cheaper and require less space but it has proved impossible to maintain consistent high quality by this method

Non-tacky parts . . . from automatic sprayer are placed on trays, carefully separated to allow air to circulate and avoid marring, then in a large frame which is rolled into an oven for final curing, which requires too much time for practical conveyor processing. One problem Ansco has had in marketing this camera is that the finish is so smooth and flawless that potential buyers think the case is plastic



Reflectors . . .

are drawn in one shot from aluminum, then trimmed and beaded. After beading they go to an automatic buffing machine (Divine Bros) for this cycle: First three heads buff with Siefen T-361 cutting compound; then Lee's Liquabrade U-4994 on head No. 4 and Bruce Products' A1A bar combination, a color buff, on head No. 5. First two heads have a sisal wheel for a heavy cut, third head has a stitched buff, and the fourth and fifth heads are muslin buffs, formed to the contour of the reflector. Table is set for 500 pc per hr. First head rotates at 3900 rpm, other four at 3200 rpm. Sisal wheel is 4½-in. dia, plain stitched wheel is 5-in. dia, and rest are 4 to 4½-in. dia. Heads 1, 2, 3, and 5 are 3 hp each and head No. 4 is 5 hp. On six-head table, head in foreground serves as loading station



After buffing . . .

removal of compound is a major problem. At Ansco this washing setup solved it, and automatically. First, reflector is pressure sprayed for 45 sec in a solution of 15 lb of Oakite 161 or Pennzal 810 to 150 gal of water at 170 to 190 F. Then it is given a cold-water rinse for 30 sec, a hot-water rinse that contains wetting agent for 30 sec, and it passes through a drying oven—equipped with steam radiators and a blower—at 200 F. Parts are carried on a roller chain conveyor. Photographically, a satin-finished reflector is considered superior, but non-professional customers demand a highly polished surface. Actually, Ansco adds a small satin-finish plate around the bulb socket to eliminate "bright spot" in flash pictures; thus satisfying both demands

Barrel finishing . . .

saves hours of bench time, assures burr-free parts. Particularly interesting is flat steel cam plate. Here's the cycle: Gravel-Flo No. 5 black granite chip with 70% mass carrying water 1 in. over mass. 700 to 800 pc per 45-in. by 36-in. compartment. No. 11 Roto-Finish compound and 45-min. running time at 30 rpm

One sub-assembly section . . .

of the assembly department is setup to assemble the right-hand side body panel, which consists of the double exposure prevention device and the ratchet film winding mechanism. Assembly is on a step-progressive basis, rather than a continuous line or conveyor system. Thus line has sufficient flexibility to permit an operator to leave her position without disrupting the line. Also, special or rush jobs can be introduced. Parts are moved from station to station on wheeled dollies; are separated in layers by stacking boards

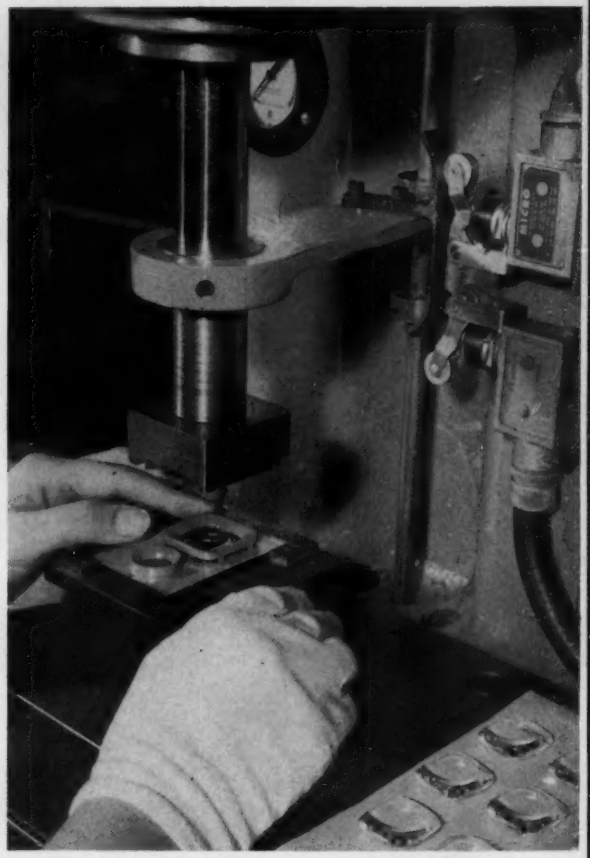
ASSEMBLY

Simple assembly fixtures . . .

utilizing toggle clamps, hold parts in position to permit easier operation. Here operators work in teams to produce top-finder lens assembly. Air-impact hammer rivets completed sub-assembly

Sliding steel fixture . . .

is used to hold body firmly in the correct position as socket-head screws are power-driven through pre-pierced holes in the metal side-panel to attach it to the plastic inner body. Fixture slides out to simplify loading. Screws are hopper-fed to power screwdriver (Detroit) which is actuated by treadle



Hydraulic press . . .
is used to assemble front finder lens to texture plate. Gage indicates correct, or excessive, pressure

Plastic nest . . .
is used to position exterior parts for assembly where a steel fixture might mar the finish. Nests are cast to an actual part as the pattern, then are ready for use

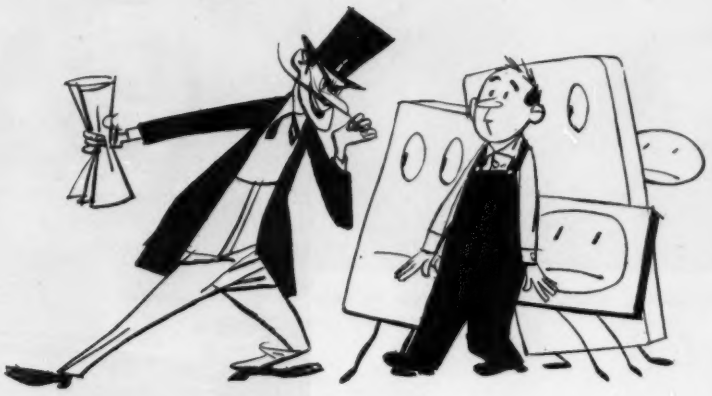
Lensometer . . .
is used to check focus and condition of each batch of lenses. Then one of three thicknesses of shim is specified for use with each lens to bring it into exact focus

Flash-switch contact . . .
is checked with this fixture, combined with a galvanometer. Fixture permits adjusting switch for proper contact and timing. Check is for mechanical operation and flash contact quality. Speed and synchronization are only spot checked because these are built into the camera. Originally inspected every part for the latter but after a couple of years without a major defect this detail was felt to be unnecessary

Final inspection . . .
covers the entire camera. Specialists can tell by sound and sight whether something is out of order. Minor troubles are corrected right at this point, to avoid sending units back through the line. Actually, each operator is responsible for checking his operation as it is completed hence, except for this final one, very few separate inspection operations are required

Round Table

Installment Blues



"Life is just a bowl of cherry pits, Al. I've got one guy in my crew who's about to jump off the water tower, he's got so many troubles."

"And he's just been at you for a raise to cure them, I'll bet."

"Right you are, Al. I wonder why everyone thinks money solves everything?"

"It sure solves a *lot* of problems, Ed. What's this guy's beef?"

"Well, he's in debt for a couple of thousand, and he has a dozen creditors chasing him for smaller bills. On top of that, I really can't get him a raise, because he's making top rate for his job. What he needs is a promotion, but there isn't one handy, and I doubt if he's really good enough for one."

"It all sounds familiar, Ed. I suppose he'll be out looking for greener pastures soon."

"Sure; he'll strike out for a higher-pay job, though he may not find it. He's a good man in his job, and I hate to lose him; but I don't think he's really good enough to be a group leader or assistant foreman."

"Too bad so many guys get in that spot, Ed. You'd think they'd wise up after a while and cut down on their foolish spending."

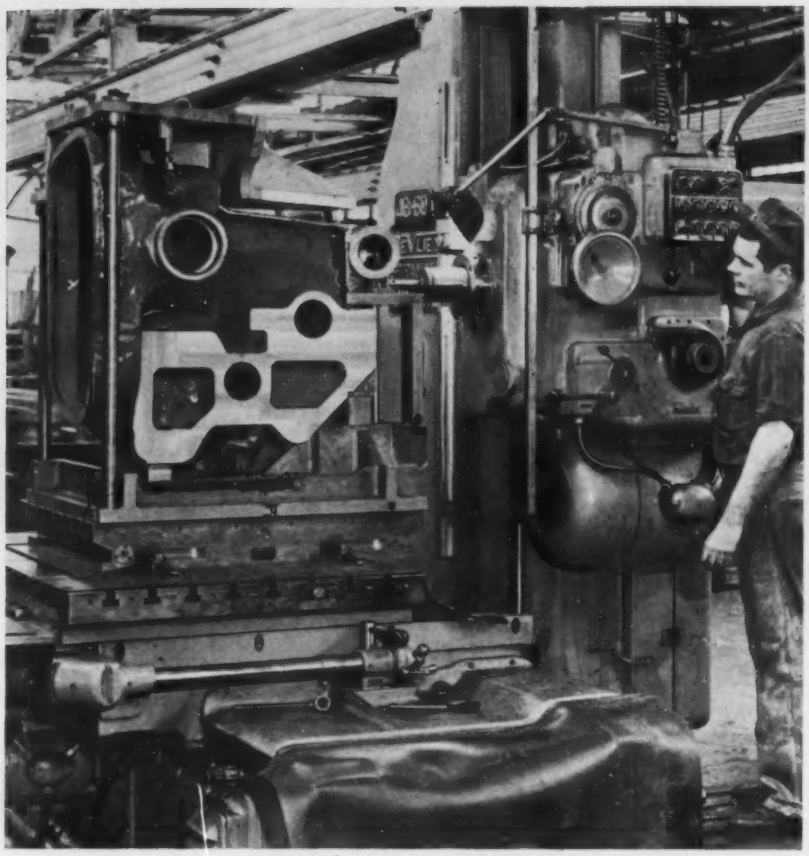
"Oh, you can't really blame a guy for putting a few bucks down on a TV set or a new washer for his wife. Credit's easy, and there's just too much temptation, Al."

"There's a lot of temptation, Ed, but that doesn't mean a smart man can't resist it. I can't respect a fellow who keeps going over his head financially. It shows bad judgment."

"A lot of families wouldn't have half the conveniences they have if they didn't take a chance once in a while, Al. All they do is stake their future earnings against the chance they'll lose their jobs; and most of them win."

"All of them would win if they saved first, and spent when they had it, Ed."

***IS IT TOO** much to expect a working man to live within his pay? Should Ed's tough-luck friend get a better-paying job, or is he going about the problem in the wrong way? Is Al right in expecting everyone to resist all temptations? Your opinions can help others. Discussions of earlier topics start on page 210.*



FINISH-BORING OPERATION on headstock clamped in fixture on table of Jigmil. Four locating pads are milled before fixture is mounted on machine table

28 headstock operations combined

Operations previously perfomed on horizontal boring machines and radial drills were combined on a Jigmil to lick a bottleneck in gear-hobber production

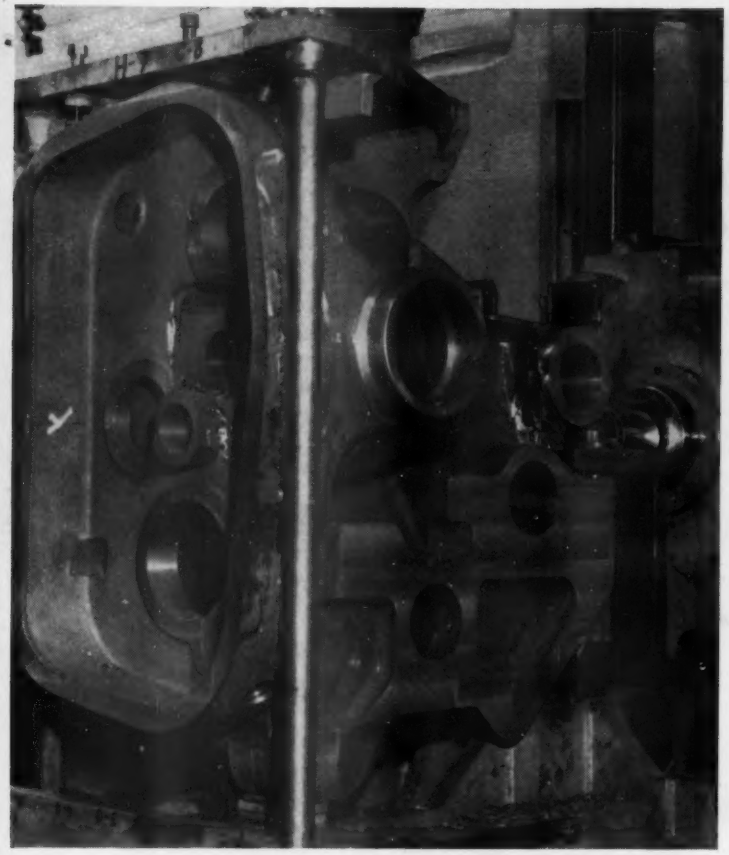
F W SINRAM, THE LEES-BRADNER CO. CLEVELAND, OHIO

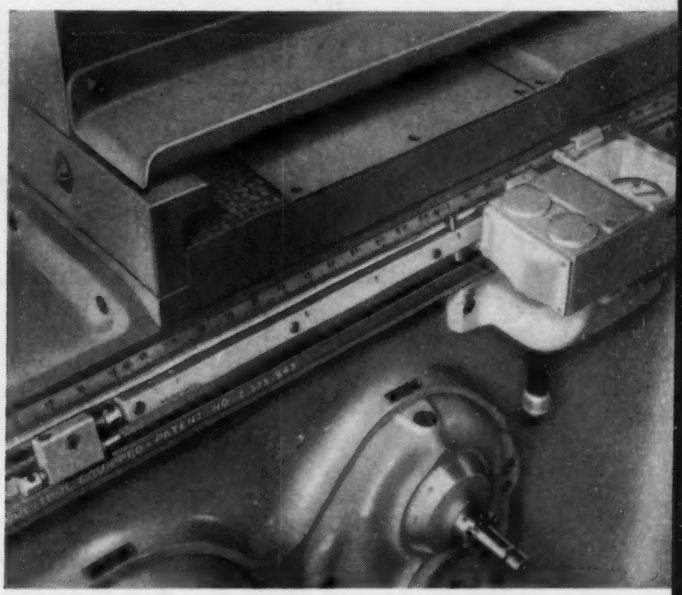
Development of the HD line of gear hobbers posed two major production problems for Lees-Bradner: to find the capacity to produce these heavy-duty models without disrupting other production, and to maintain quality.

In the case of the headstock, both problems were solved by combining operations on a 4B-60 Jigmil. Previously these operations were performed on horizontal boring mills and radial drills. Needed capacity on these machines was made available, several hours were cut from machining time on the headstock, and improved accuracy reduced assembly time.

The Jigmil provides a fixed and definite relationship between the horizontal and vertical slides. Automatic functions include: Spindle bar is tripped automatically at any predetermined point by setting combination dials and vernier scales for required depth of feed. Spindle head is equipped with a preselective, automatic speed-changing mechanism. All speed changes are made automatically through a single control. Machine spindle is equipped with power-lock mechanism for locking and releasing the cutting tools. Automatic positioning of machine table and spindle head is performed through a sequenced electrical cycle. Hole spacing in the work is controlled to precise limits through a single control. To facilitate tool changing and work inspection, the machine table is retracted parallel to the spindle axis and repositioned automatically by pushbutton control.

Combination of the Duplitrol system and the automatic positioning cycle provides a means of quantity production to precise limits. A set of two spacing elements, Duplitrol bars, is mounted on the machine. One is on the side of the table to position the table in the horizontal plane, the other is in





SPACING BAR on side of table controls horizontal positioning of the machine table

SURFACES, BORES, AND COUNTERBORES machined on two sides of headstock are seen here. Altogether, 28 machining operations on four surfaces are required

to reduce layout, machining time

the vertical trough to position the head in the vertical plane. Each bar is provided with a stop pin. With the pin in correct location and automatic-positioning cycle engaged, the pin contacts an arm projecting from the positioning unit, locating the table or head.

MACHINING SEQUENCE

Headstock casting for the HD hobber is smooth-grained cast iron. As several surfaces are machined, the headstock must be repositioned several times.

Operations sequence is arranged to allow time for heat to dissipate to retain accuracy between the various holes and surfaces. Drilling operations are kept at a minimum, the Jigmil being reserved as much as possible for layout, rough and finish milling, and rough and finish boring of cored holes.

First, the casting is located and clamped on the index table. In this position, four pads are milled to provide locating points in the holding fixture that will be required later. At the same time, two holes are drilled and reamed. The oil-sight hole, previously a difficult problem because of its location with relation to other holes, is also drilled and counterbored at this time.

The casting is removed and the fixture mounted on the index table of the machine. The casting is then set in this fixture, using the four pads just milled as locating points.

All faces are rough-milled and all cored holes are rough-bored, indexing the table as required to bring surfaces and holes into position. The index table is then brought back to its first position, and with the casting still in its original position in the fixture, the surfaces are finish-milled and the holes are finish-bored.

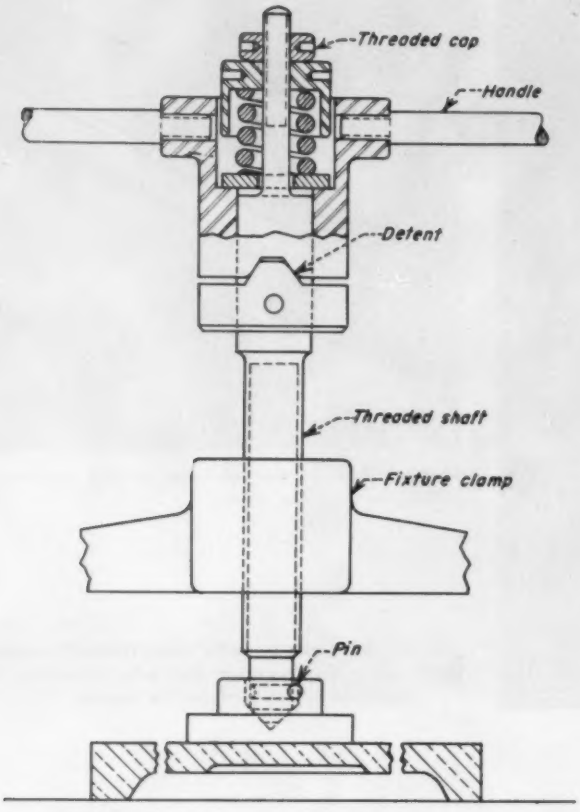
LAYOUT SIMPLIFIED

Thus all layout work is done on the machine. Thirteen surfaces or faces are milled and twelve cored holes are rough and finish-bored. In addition, two holes are drilled and reamed, and one is drilled and counterbored.

Not only is the correct dimensional relationship between holes in the same plane maintained by machine positioning, but also between the holes in different planes.

Time-consuming layout work with squares and gages is reduced to a minimum, and the ease with which the depth of feed may be controlled also reduces the actual machining time.

Practical Ideas . . .



Adjustable-Pressure Jig Clamp Prevents Damage to Thin Work

Thin work, especially of non-ferrous materials, can be held safely in a jig or fixture, using this clamp to help prevent distortion resulting from too great a clamping pressure on the work. The device is basically a long threaded shaft which is rotably fastened at one end in the fixture base. At the other end is a spring-and-detent arrangement which can be preset to prevent clamping beyond any desired pressure.

A tapped hole in a boss of the fixture clamp is engaged to ride up and down on the threaded shaft. As the handle of the clamp is tightened, the clamp contacts the work and exerts pressure. As the handle is turned further, the upper half of the detent (in this case with 60° sides), rides up over the lower half, which is locked and pinned in place on the threaded shaft. Thus further turning of the handle does not change the effective clamping pressure.

The base of the threaded shaft has a groove turned in it which is clearance for a pin located in the fixture base. The shaft can turn without pulling out of the base.

All edges of the detent should be rounded, and the working surfaces must be polished, for smooth functioning of the device. The sides of the detent can be at whatever angle is desired, consistent with the needs of the fixture.

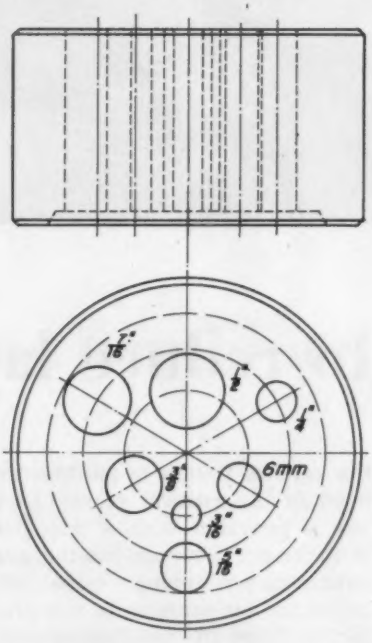
Clamping pressure is changed by adjusting the threaded cap and lockscrew at the top of the threaded shaft. *W M Halliday, Lancashire, England*

Masking Tape Holds Thin Work

We often have to mill thin, fragile work parallel, and find that the work cannot be held in a vise without distortion.

To hold these parts to finish the second side, we simply place double-faced masking tape on the milling machine table, gently pressing the tape into place.

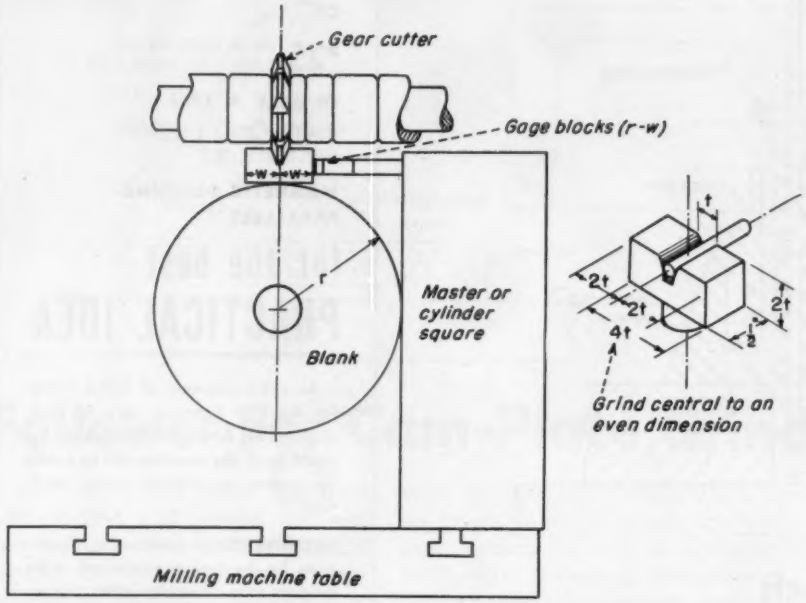
This makes a large surface to hold the work, and we have found that we can take cuts as heavy as 0.040 in. without disturbing the position of the work. *Harold F Starkel, Los Angeles, Calif*



Hand Tapping Guide

A simple but not often thought-of device is this round block with holes in it which are the size of the major diameter of the most commonly used taps.

The block is laid on top of the hole to be tapped, and the hole is located through the block. The tap is thus kept vertical while the first few threads are cut, after which the block can be removed. This prevents sliding the work around on the vise looking for rectangularity. *P Repping, Transvaal, South Africa*



Method for Setting Gear Cutters

In instrument work it is sometimes necessary to set up a spur-gear cutter centrally over the blank to closer tolerances than the commonly used methods permit.

The method shown here has been developed to let us set up this kind of work to whatever tolerance is necessary. A block of steel about ½ in. thick, about twice as deep as the cutting tool, and wide enough to allow finish grinding to an even decimal dimension about 4 times the full width of tooth, is clamped in a milling vise.

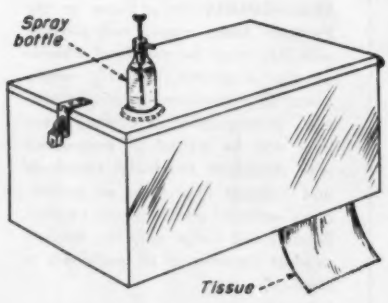
The cutter is centralized as nearly as possible by scale measurement, and a cut is taken to full depth of the cutter tooth.

Then a pin of a diameter to engage the cut at the approximate pitch line is placed in the cut, and the sides of the block are ground to centralize the pin and obtain an even decimal dimension.

To use the block, set it up on top of the gear blank, and position the cutter so its lowest cutting edge is on the vertical centerline. Raise the table until the cutter seats in the block, and all play is taken up.

With a master square set on the milling machine table, and the correct gage blocks in place, the work is positioned with the cross feed until the blocks just touch the square and the setting block.

If special gears are to be cut, the lower part of the block may be turned and ground cylindrical, permitting use of the system with the work set up to a helix angle. This block should be marked and kept with the cutter for possible future use. The system also works well with many kinds of symmetrical form cutters. *Raymond L Levy, Westerly, RI*



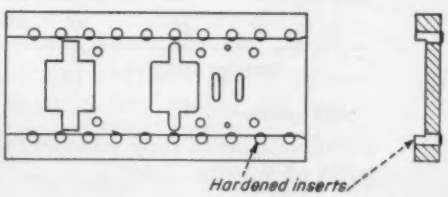
"Service Station" For Safety Glasses

Many companies go to a great deal of trouble to encourage the use of safety glasses, but employees often fail to do so, and accidents result which might have been prevented.

Another device to make it easy for operators to use safety glasses consistently is this "service station" which is a hinged box with cleaning tissue on one side and a spray bottle of glass cleaner on the other. We use a mixture of one part of carbon tetrachloride and three parts of water, which removes oil very effectively.

The box has a sheet metal bottom, slotted to permit removal of the tissues, and a notch in the top to let the top of the spray bottle stick out, yet prevent its unauthorized removal. The hinged cover is locked with a padlock.

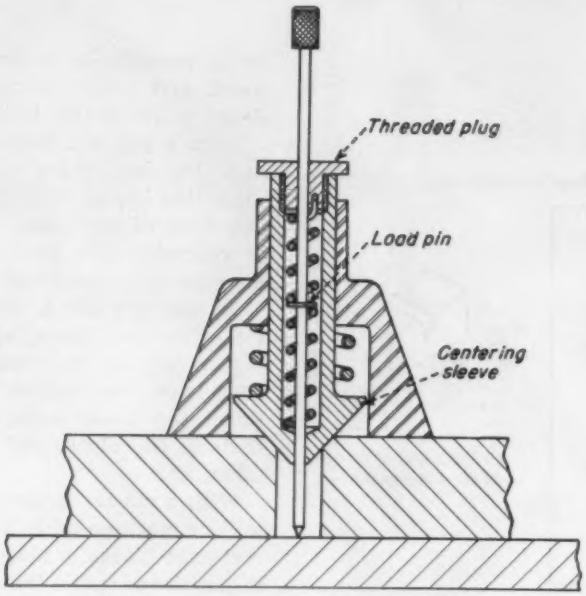
We have found that the men like this idea very well, and they are encouraged to use their glasses more often. The result is that we get a good safety record without disturbing morale. *Henry George, Bronx, NY*



Hardened Drillrod Inserts Stop Small Punch Breakage

We traced the cause of breakage of small pilot punches in one of our dies to excessive clearance between the badly worn stripper slot and the stock.

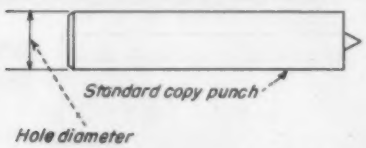
To reclaim the stripper plate, and prevent a recurrence of the same trouble, we press-fitted hardened drillrod along the length of the soft steel plate, and then ground the rod to the proper slot dimensions. *George A Jonas, Glen Oaks, NY*



Universal Copy Punch

Copying a hole from one plate to another can be either by clamping the plates together and drilling directly, or by marking through the drilled plate into the work.

The former method is sometimes difficult or even impossible, because of heavy work, lack of clearance, or lack of suitable clamps, and the method of punching through the finished plate requires



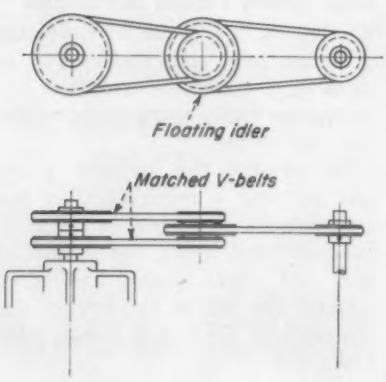
a complete set of copy punches for holes of various sizes.

To simplify this kind of work, we have made a universal copy punch which will work with holes of a wide range of sizes and thicknesses of plates.

The centering sleeve slides with an easy slip fit in the body of the tool, and is pressed down with a spring and retained with a threaded plug which centers the punch.

The punch, with its load pin, is adjusted for proper depth of hole. For quick change for deeper holes, the knurled head on the punch should be threaded for removal.

This device depends on the holes being properly deburred or countersunk. *R Stork, Transvaal, South Africa*



Pulley Changes V-belt Ratios

A novel method of changing the speed ratio between the motor and spindle of a drillpress beyond that of a single V-belt drive is given by the sketch shown here. An idler pulley between motor and spindle gives the effect of step up or reduction, whichever is needed. The idler pulley floats, and is not supported except by the belts. *W A Furst, Ardmore, Penna*

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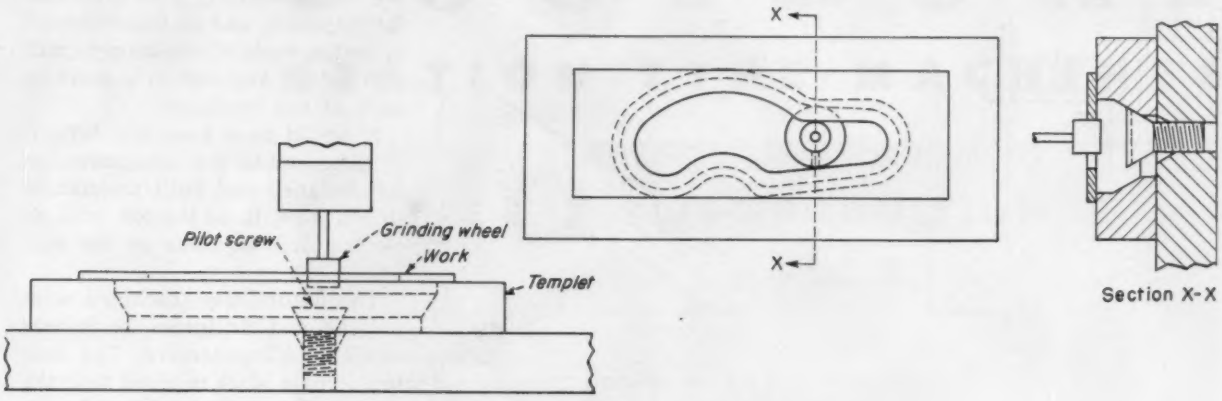


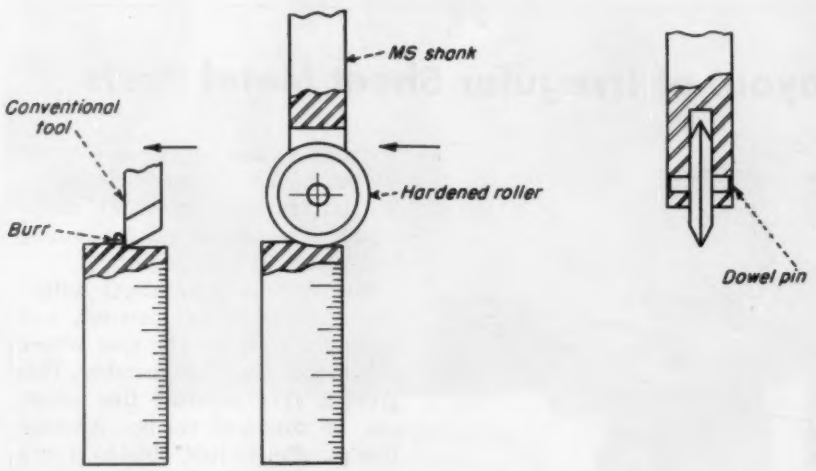
Follower For Cam-Plate Grinding

A number of cam plates had been heat-treated and ground flat, and had to be ground on the internal profile. To insure accurate reproduction of the profile as quickly as possible, the method shown here was worked out.

The work is clamped on the upper side of the templet, which is free to move on the grinder table. The templet is machined accurately with an internal profile which is an exact duplicate of the desired form, except that it is made larger, to allow for the size of the follower. The grinder table carries a screw with a tapered head which acts as a pilot or follower, and is axially aligned with the grinding wheel

In operation, the templet is held in contact with the screw, and is moved by hand so it is always in contact, reproducing in the work the path followed by the templet.

To compensate for wear of the grinding wheel, the screw is withdrawn slightly from the grinder table, permitting the work to move toward the axis of the grinding wheel. It is impossible to grind the opening oversized if the screw is properly adjusted. *L Kasper, Philadelphia, Penna*



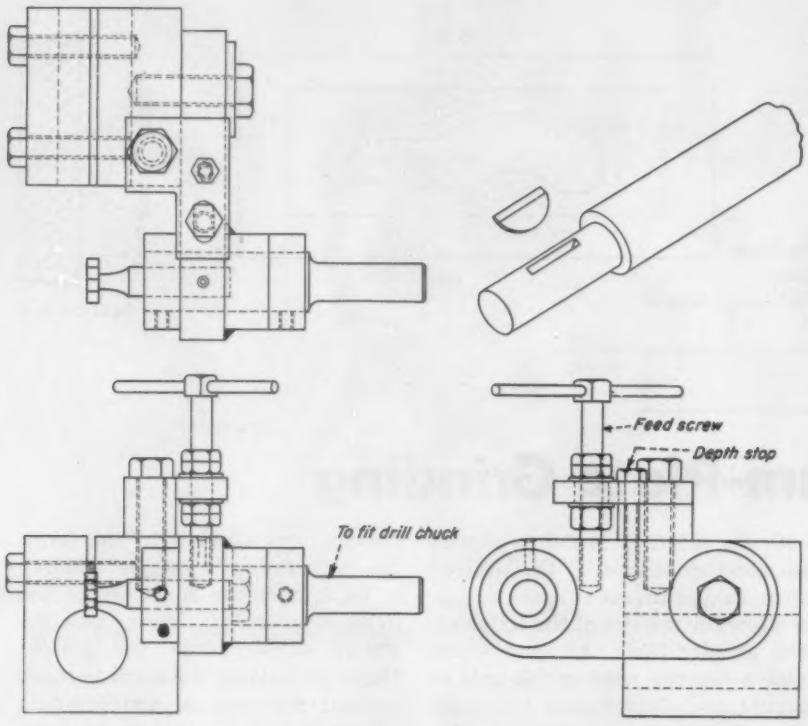
Rotary Graduating Cutter

We do quite a bit of special graduating work on circular dials, using a milling machine and dividing head. In the past we have used, as a cutter for the graduations, a toolbit sharpened to a very acute angle. This tool would cut a good, sharp line, but it had two drawbacks. Its fine point was very susceptible to breakage, and it would throw up a bad burr.

To eliminate these objections, we have made a rotary impressing tool, shown here, which has never chipped or broken in use, and it leaves no burr at the end of the cut. The marks it makes are sharp and clean, with a neatly tapered runout at the end of the mark, caused by the circularity of the tool.

The tool should be made of tool steel hardened to about 58-60 R_c. The hole is lapped to a snug running fit on the standard hardened dowel on which it is mounted. The knife edge should be ground on a cylindrical grinder. The edge may be slightly flattened off to give a heavier division mark without great depth, if so desired. This flatting off will also increase the strength of the edge.

The slot in the holder should be carefully milled in width, to make a snug fit on the roller, so there is no side play. *H J Gerber, Stillwater, Okla*



Fixture Helps Mill Key-Slot In Assembled Machines

We had assembled some machines for shipment, and an improvement in design made it necessary to mill a Woodruff key-slot in a shaft on each of the machines.

It would have been too difficult to disassemble the equipment, so we designed and built the fixture shown here, to do the job with an electric drill in place on the machines.

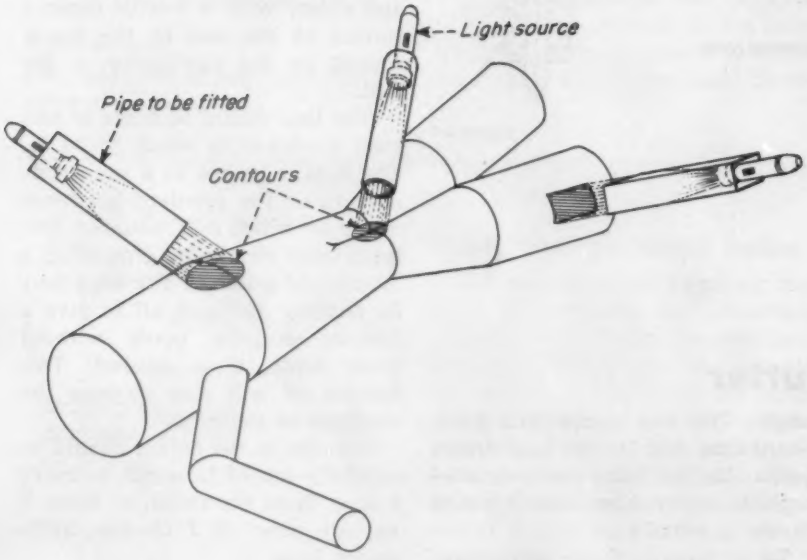
The fixture was machined with a lathe and drillpress, so it was simple and inexpensive. The hole in the main block is bored to fit the shaft to be milled. Split sleeves could be used for different sizes of shafts, and different sizes of cutters could also be used.

The arm which holds the key-seat cutter shaft is pivoted on a bolt, and an ordinary setscrew feeds the cutter into the shaft. The screw must be turned counter-clockwise to back the cutter out.

The depth stop is a hex-head capscrew which can be set to adjust the cutter to a certain depth when different work is to be milled.

These units worked very well, with a ½-in. electric drill for power. *E A Werner, West Bend, Wis*

Flashlight Aids Layout of Irregular Sheet Metal Parts



Shown here is a very simple method for laying out contours on irregular surfaces of sheet metal which is to be cut out for joining two pieces at odd angles.

Simply hold a flashlight within the member to be fastened, and shine the light on the spot where it is to join the other member. This gives a very accurate line which can be followed easily. Another line parallel to this, outside it at a distance equal to the thickness of the work, gives the contour line to be cut.

For best results, keep the light source at least six or seven diameters away from the hole to be cut, to keep the light from flaring out and giving a false contour. *A A Ayala, Monterrey, Mexico*

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American Machinist REFERENCE BOOK SHEET

CHECK LIST FOR JIG AND FIXTURE DESIGN . . IV

G R TINDALE, SOUTH AUSTRALIA

Too often, features of jigs and fixtures essential or important to proper operation are overlooked in the design stage. The author has prepared a check list of questions in nine main categories. The questions for the first two categories were published in the previous installment (*AM*—Sept 12, '55, p163), and the remaining ones are published here

3. Positioning Tool to Cutter

3.1 Tool Features

Have headed bushings been provided, so that they stand clearly above the chips and coolant lying on the jig plate?

Are the jig feet large enough to span the T-slots in the table?

Are the feet high enough to allow the drill to pass through the component without striking or injuring the machine table?

Have "roll over" curves been provided to assist in turning the jig over?

Can the jig be clamped directly under the machine spindle?

If not, is it light enough to position easily under the spindle?

3.2 Special Equipment

Could the jig be more effectively presented to the cutters by mounting it on a rotary or indexing table, or on trunnion mountings?

Would it be advantageous to rest the jig in an angle block, clamped under the machine spindle, when drilling holes on an angle?

3.3 Machine

When used on a multi-spindle machine, can the jig be nested into suitable table stops under each spindle, as it is moved from one position to another?

Can suitable fences or table stops be used to prevent the jig from rotating with the cutter?

3.4 Cutters

Has the fixture been designed to keep the amount of cutter travel to a minimum?

Is it possible to design the jig so that all holes of the same size can be drilled to their correct depths with one setting of the cutter spindle?

Is the jig light enough to enable it to be pulled into place by a slender drill, if it is not quite correctly positioned?

3.5 Operator

Can the operator see clearly all the bushings or cutter guides when positioning the jig?

Does the jig need a handle to allow the operator to control it easily, and to resist its tendency to twist?

If the fixture is to index, can the index pin be withdrawn easily?

Can the index pin be unlocked and withdrawn by the one movement?

Will the index pin locate quickly and accurately when engaged?

Will a handle or handwheel assist the operator to index the fixture?

4. Cutter Guiding

4.1 Nature of Operation

Do the cutters need guiding for this operation?

If so, are the guide bushings long enough to give adequate support to the cutting tool?

Are the bushings too long, giving excessive rubbing surface, and restricting the escape of chips?

Is the required accuracy such that the bushings need to touch, or almost touch, the surface of the work?

Is the surface of the work contoured or on an angle so that the drill cannot enter squarely?

If so, does the end of the bushing need to follow the contour of the part, in order to guide the drill effectively?

Would a bushing, supported on ball bearings, be an advantage for piloting that slender boring bar?

4.2 Second Operations

Do the tools need guiding for a second operation such as countersinking or reaming?

If not, would a hinged or latch-type jig plate swinging out of the way after the first operation, be better than removing slip bushings?

Is it possible to avoid slip bushings, by using stepped drills for combining the drilling and counterboring operations?

If stepped drills are used, has the largest diameter entered the bushing, and is it adequately guided, before the smaller leading end begins to cut?

If slip bushings are required, have hardened liner bushings been provided to locate them?

4.3 Coolant

Is the machine equipped with a coolant pump and tank?

Can the coolant reach the cutting edges of the tool?

Would suitable funnels or channels be an advantage to carry the coolant where it is required?

Are fences or guides necessary to prevent the used coolant from running to waste?

Is a guard required to protect the operator from coolant spray?

4.4 Cutters

Have chip flutes been provided in the pilots of counterbores, etc, to prevent them from binding in the guide holes?

When the cutters have been shortened by sharpening, will any part of the chuck, collet, or arbor foul on the jig or fixture body?

Can the heads of bushings be used as depth stops by allowing hardened collars on the cutter stems to contact them?

Have the bushings an adequate "lead in" chamfer for the drills?

If a drill strikes a headless bushing hard, driving it a little way through the jig plate, will this affect the accuracy of the operation? Perhaps headed bushings would be better.

Long slender drills tend to whip when running at high speed. Is it any disadvantage to having them guided in the bushings all the time, even when the jig is being loaded and unloaded?

4.5 Operator

Has the bushing plate been correctly marked near the bushings

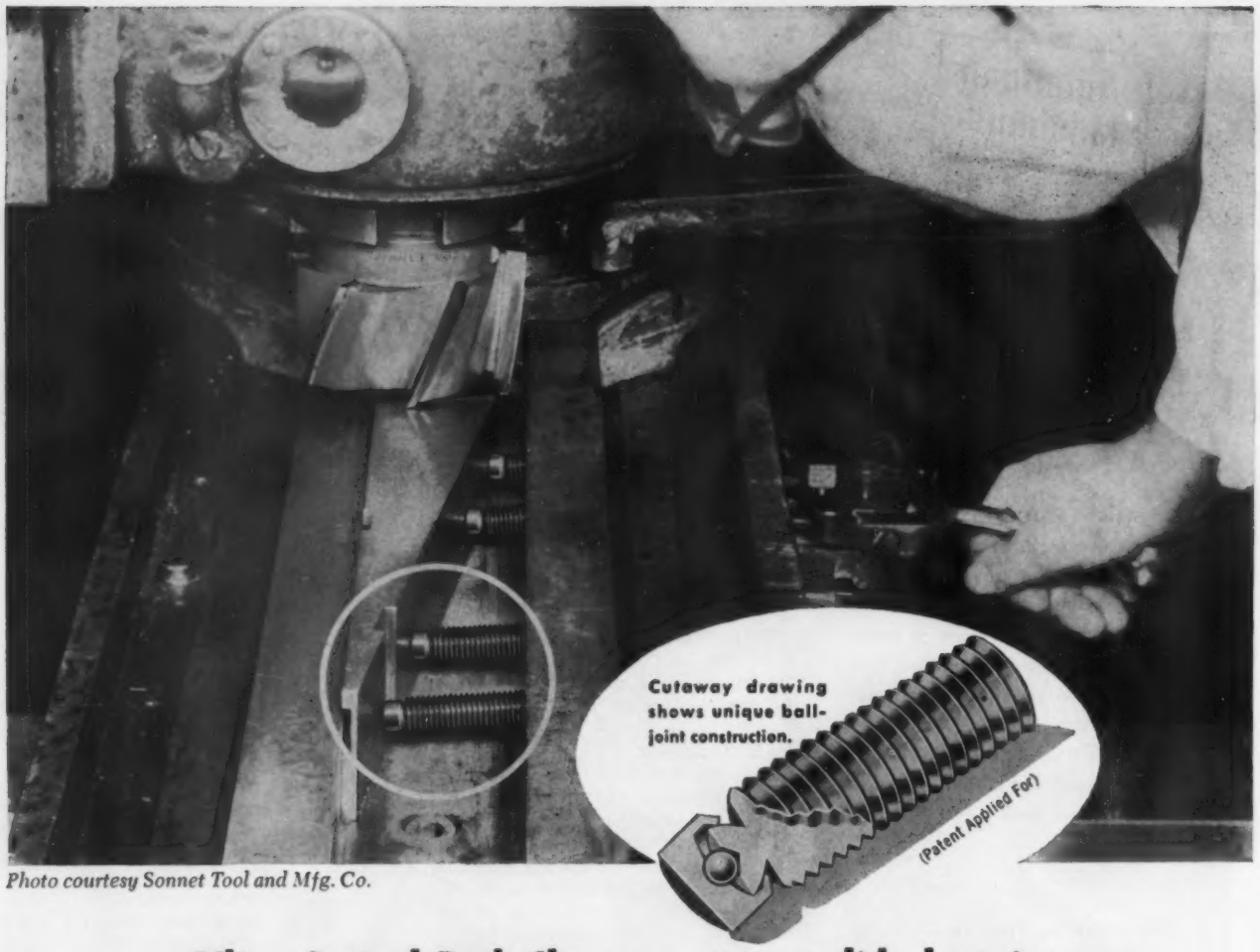

Photo courtesy Sonnet Tool and Mfg. Co.

Vlier Swivel-Pad Clamps assure solid clamping of parts in jigs and fixtures without marring their surfaces

Unique ball-joint construction prevents binding of the pad; assures automatic adjustment to off-angle surfaces

The mill fixture shown above demonstrates the usefulness of Vlier Swivel-Pad Clamps. Four Swivel-Pads are used to clamp the part rigidly in the fixture for the milling operation. Maximum rigidity is imperative in this setup if the high efficiency of the Sonnet "Helicarb" Shell-End Mill is fully utilized.

First touch of the pad against the work piece adjusts the pad face to the surface of the part and stops pad rotation. Extreme clamping pressure can then be applied to the part without damage, since screw torque is taken up by the pad, not the part. Swiveling the pad on a ball eliminates binding and assures frictionless adjustment to off-angle surfaces up to 7½ degrees each side of the center line.

Uniform clamping pressure

Design of the ball-joint causes the clamping force to be distributed equally to every point on the pad face. The pad is machined from solid stock for greater strength. The face of the pad is ground flat, not counterbored or relieved, for maximum holding surface.

Insert from either end

Since the pad diameter is less than the body diameter Swivel-Pads can be inserted in the jig or fixture from either end. This feature is especially helpful where space is limited.

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CHECK LIST FOR JIG AND FIXTURE DESIGN . . V

with the drill sizes to be used in the respective holes?

Have slip bushings been marked "Drill" or "Ream," according to their function?

If slip bushings cannot be avoided, are the heads large enough, and fluted (not knurled) to allow the operator to grip and turn them easily?

Is there room for his finger tips under the heads of the slip bushings?

Would it be an advantage to provide handles for extracting slip bushings?

Have the slip bushings been provided with an effective means of locking them in place?

When taking them out, can the operator turn them to a stop before lifting them, this making it unnecessary to feel for the right place?

5. Chip Control

5.1 Nature of the Part

Is the material of the component such that it will produce continuous chips (as in steel), or discontinuous powdery chips (as in cast iron)?

Will the accuracy of the component allow enough space between the drill bushing and the work to allow discontinuous chips to escape without having to pass through the bushing?

When drilling materials which produce stringy continuous chips, has the clearance between the bushing and the work been reduced to zero, to enable chips to pass up through the bushing, thus avoiding chip tangles within the jig?

5.2 Tool Features

Do all supporting pads and pins stand well clear of chip collecting surfaces?

Have all locating pins with rest shoulders been relieved in the corners to provide chip and burr clearances?

Have locating and supporting surfaces been kept as small in area as practicable?

Has chip and burr clearance been provided in V locators?

Have chip collecting pockets and corners been eliminated as far as possible?

Have openings and ramps been provided to allow chips to escape from the jig?

Can channels or races be provided to allow the coolant to wash the chips away in a desirable direction?

Have suitable guards or shields been provided to prevent chips from fouling and wearing jack pins, index plates and plungers?

Will chips foul the clamp lifting springs?

Have the jig feet been kept as small in area as possible, consistent with their ability to bridge the T-slots of the machine table?

Can the jig feet be secured to the jig from their top surfaces, thus avoiding holes in the bearing faces where chips may collect?

5.3 Machine

Is it desirable to fit chip-removal equipment to the machine?

Are chip tangles likely to interfere with operation of the machine?

Is an air blast desirable for cleaning out the fixture before reloading it?

5.4 Cutters

Has ample chip clearance been provided in flutes of the cutters?

Has the fixture been designed so that the cutter flutes are not prevented from discharging chips through being covered up?

5.5 Operator

Are all locators and supports easy for the operator to see and keep clean?

If the operator cleans the chips out by knocking the jig on a bench, or on the edge of the machine table, can suitable bumpers or fiber, hardwood, or neoprene be provided to minimize damage to both jig and machine?

Should the operator be provided with a chip rake or cleaning probe?

6. Measurement of Part

6.1 Cleaning

Is it necessary to measure the part while it is still in the fixture?

If so, is it possible to clean it sufficiently for this to be done?

Will burrs prevent the accurate measurement of the part?

6.2 Clearance

Is there enough clearance between the tools and the component to admit the necessary scales, gages, or calipers?

Will the cutter be in the way?

6.3 Nature of Measurement

Is the nature of the measurement such that the whole jig, complete with part clamped in it, should be presented to the measuring device?

If so, has the tool been designed to suit the gaging device?

6.4 Datum Faces

Is it desirable to provide measuring blocks, datum surfaces, etc, from which to check?

6.5 Operator

Can the operator easily see the surface he is to measure?

Can he see the gage or scale in the measuring position?

7. Safe Working

7.1 Part

Have all necessary steps been taken to prevent the components being damaged during the operation, or in the handling to and from it?

7.2 Tool

Is the tool sturdy enough to prevent it being damaged or broken during normal use and abuse?

Can it be damaged or rendered inaccurate through parts being inserted incorrectly?

7.3 Machine

Is the machine likely to be damaged by accidental breakage of part, tool, or cutter?

If the fixture rotates, has it been balanced to minimize machine vibration?

7.4 Cutters

Is it necessary for the operator to have his hands near the cutter while it is in motion?

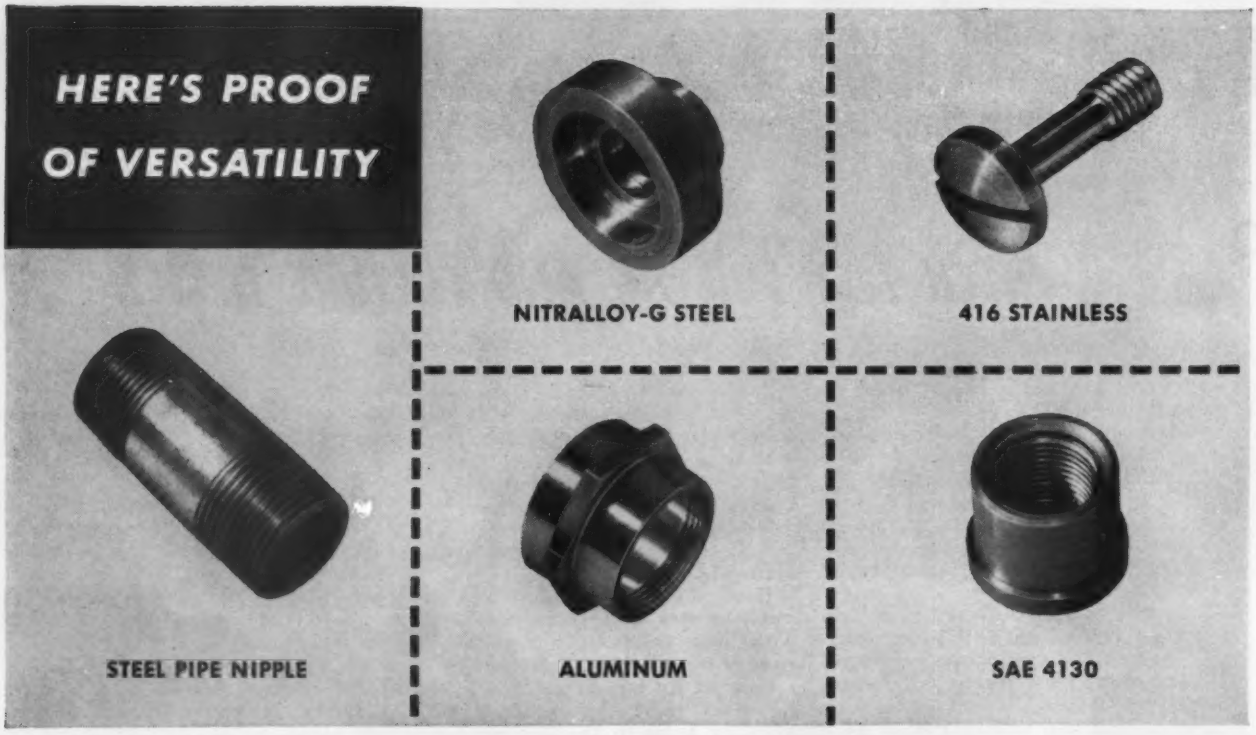
If so, is the cutter properly guarded?

Could the cutter be damaged by striking the jig or fixture?

7.5 Operator

Can the operator see clearly what is going on at all times?

Have all unnecessary sharp edges and corners been removed from the



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CHECK LIST FOR JIG AND FIXTURE DESIGN.. VI

fixture, to avoid cutting or bruising the operator's hand?

Have screw heads been let into counterbores wherever possible?

Are there any sharp or awkwardly placed levers or handles to catch in clothing?

Is there ample clearance for fingers and knuckles around all handles, knobs and slip bushings?

Is any leaf, cover, or clamp likely to fall on the operator's fingers?

Is the operator protected from flying chips or coolant spray?

If the clamp failed, could the part fly out of the jig and injure someone?

If the clamp is air operated, should the mechanism contain a positive interlock so that if the air pressure failed, the clamp would not become loose?

Have suitable safety stops or guards been employed on air-operated clamps to avoid crushing the operator's fingers?

Should the tool be marked with a warning notice, to caution the operator against improper or dangerous practice?

8. Handling and Storage

8.1 Lifting Aids

Have lifting lugs, eyebolts, or chain slots been provided for slinging heavy tools?

Have lifting handles been attached to all awkward or heavy loose parts of the fixture?

8.2 Loose Parts

If loose parts such as spacing pieces, wrenches, or locating pins are unavoidable, can they be attached to the fixture with keeper screws or light chains, to prevent loss in storage?

8.3 Fragile Parts

Is there any fragile part of the jig which needs a protective cover in storage?

Is the tool so delicate or highly finished as to require a special case, cover, or box to protect it in storage?

8.4 Identification

Has the tool, and all loose items belonging to it, been marked clearly with identification numbers or symbols?

8.5 Storage Aids

Can the tool be stowed safely without danger of tipping over?

Is a special storage stand or rack desirable for safe and convenient storage?

9. Manufacture and Maintenance

9.1 Cost

Has the cost of the tool been properly related to the quantity and accuracy of the component to be produced?

Is it too expensive for low-volume production?

Are the production requirements high enough to warrant a better class of tool?

9.2 Standards

Have standard, or readily purchasable, parts been specified wherever practicable?

Have all parts been designed for manufacture from stock-size materials with a minimum amount of machining?

If the material is not carried in stock, is the right kind and size readily available?

9.3 Manufacturing Facilities

Can the tool be made with the available toolmaking labor and equipment?

Are the tool dimensional tolerances as wide as possible?

Has the design included suitable datum surfaces for toolmaking operations?

Is it easy to set up the fixture for grinding locators or supports which have to be sized in assembly?

If so, is there plenty of clearance for the grinding wheel and spindle?

Has provision been made for easy alignment and starting of "pressed in" parts which need accurate location?

Have blind holes been avoided wherever possible?

Would it help the heat-treater to drill a small hole in each part which normally has no holes in it, so that he may suspend it in his salt bath by a wire threaded through the hole?

9.4 Design Points

Are all parts well designed to take the loads imposed on them in service?

Is the tool sturdy enough to stand considerable abuse?

Is the fixture amply proportioned to damp out vibration and chatter? This applies especially to milling fixtures.

Is the design of all parts and mechanisms as simple as possible?

Have cylindrical plungers and holes been used in preference to square or polygonal ones?

Have holes for headed "pressed in" parts (such as accurate location or rest pins) been countersunk to allow any excess press lubricant to collect in the countersink, instead of gradually squeezing out under the head and allowing the rest pin to sing slightly in service?

Have spring pocket holes been countersunk on their open ends?

Are the dowl pins in each part as widely spaced as practicable?

Where detachable parts need very accurate location, have register keys or pins been used instead of dowels?

Is the accuracy of the operation such that the base of the fixture should be scraped to fit the machine table?

Have breather holes been drilled to allow air to escape from close-fitting plunger holes, etc?

Is it possible to forecast any component design changes and to make allowance for them in the design of the fixture?

9.5 Provision for Maintenance

Has provision been made for lubricating the tool mechanisms?

Have all wearing parts been hardened?

Are these parts easily made and replaced?

Have correct materials and heat-treatment been specified?

Has provision been made for easy removal of "pressed-in" parts?

Can vulnerable parts be removed and replaced quickly without disturbing the setup of the fixture on the machine?

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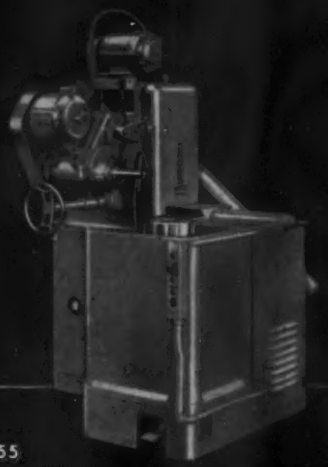

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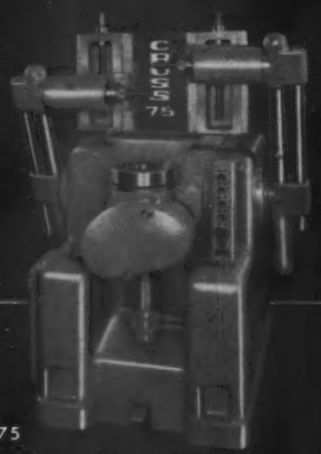
Typical production—rounding or pointing 8 pitch 30 tooth gears—55 net hourly.

NO. 65

For pointing or chamfering external and internal—
clutches • spur gears
bevel gears • splines
Typical production—pointing 10 pitch 30 tooth gears—100 net hourly.



NO. 75

For burring or chamfering both ends at the same time—
helical gears • spiral bevel pinions
hypoid pinions
Typical production—chamfering 8 pitch 40 tooth gears—200 net hourly.

- ★ **Flexibility for handling a wide variety of gears.**
- ★ **Rugged, heavy duty construction for continuous high production or job shop operation.**
- ★ **Short setup time (as little as 15 minutes) for changing from one gear to another.**
- ★ **Simple, inexpensive tooling.**
- ★ **Push button controlled automatic cycle.**
- ★ **Hydraulic power work clamping.**

For mass production or short run jobbing operations, there is a Cross Gear Machine to suit your requirements.

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THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

American Machinist

SPECIAL REPORT NUMBER 405

THE CHICAGO SHOWS 1955

Center arena at Amphitheatre (above). Entrance to Production Equipment Show (below)

CHICAGO—The most successful Machine Tool Show ever held in this country was staged at the International Amphitheatre Sept 6-17 by members of the National Machine Tool Builders' Association.

It was the first show of its kind since 1947. Happily, it surpassed the 1947 exhibition in virtually every respect—in attendance, in the quality and range of visitors (top automotive men as well as master mechanics, superintendents and foremen), in the keen buying interest shown by users, in display facilities, in the innovations incorporated in machines themselves, in the practical demonstration that new developments in American machine tools have been greater recently than at any previous time.

More kinds of machine tools were on exhibition than were ever before put together in any single show. The show's physical facilities, to be sure, fell far short of the spaciousness at Continental European shows. Nevertheless, the Amphitheatre and a new Exposition Hall adjoining it were converted into a breath-taking mammoth machine shop in action. Some 917 metal-cutting and metal-forming machine tools using 15,008 hp were in operation. It was the most impressive assembly of machine tools in history, from the standpoint of the ratio of total power to total machines, with the possible exception of a few huge US automobile plants.

The Machine Tool Show, together with the Production Engineering Show at the Navy Pier, was larger in actual exhibit space than the 1947 show at the Dodge Chicago plant. In its standardization of booths (company signs, absence of flashy big backdrops, low railings separating one exhibitor from another), the show reflected the influence of the recent European machine-tool shows.

More than 1000 foreigners came to Chicago for the show, over 300 from Canada. Sizable groups from South America, Mexico and Japan had their travel arrangements made by Amertool Services Inc, which handles sales in certain foreign countries for 18 US machine-tool builders. Substantial delegations were noted from various European nations. Important buyers of US machines, from such companies as Fiat in Italy, Opel in Germany and English Electric, visited the show.

Automation came into its own for the first time at any machine-tool show. Leading machine-tool users laid down a challenge some two years ago that the builders should assume the responsibility for automating their machines — getting the work into and out of the machines quickly by mechanical means and thus speeding production. Machines at Chicago were proof that the builders had accepted the challenge. But automation as revealed at the show went a lot farther than merely feeding and ejecting workpieces. It included numerically controlled, tracer-controlled, and self-resetting machines.

A large part of the show, in fact, consisted of automatic, high-production machine tools. Machines, on the whole, were heavier and stepped up greatly in power compared with those at any previous show. Automation has become such a popular word that it was not unusual for a visitor to go into a booth and say to an attendant, "I want to see whatever you have here that is automated."

It would be a mistake, however, to conclude that automation completely stole the show. On display at Chicago were hundreds of general-purpose machine tools which represented notable advances in design and per-

Many Foreign Visitors Came to the Shows

Hundreds of metalworking men come from Europe and the Americas, many ready to buy despite dollar shortages. Seated here is Hermann Heller, prominent German machine-tool builder who flew to Chicago. Mr Heller was chairman of the committee in charge of four European Machine Tool Shows—Paris in '51, Hanover in '52, Brussels in '53, and Milan in '54. With him (left to right) are Burnham Finney, editor of AM, M A Hollengreen, president NMTBA, and Teil Berna, general manager, NMTBA

WORLD'S GREATEST SERVANT
"YES, SIR! VERY GOOD, SIR!"
NOW HAND THE GENTLEMAN THE MONEY.
HIGHER WAGES FOR BETTER PRODUCTS AT LOWER PRICES
MACHINE TOOL SHOW
INTERNATIONAL AMPHITHEATRE
SEPT. 6-17.

"The Chicago Tribune" carried this cartoon, in color, on its first page for Saturday, Sept. 10. It is a good depiction for the layman of the theme of the shows. Used with permission

formance compared with previous models. Builders recognized the fact that most of the metal-cutting work is done on such machines and that standard machines account for the major share of the industry's sales. By far the larger number of machines on display were in that classification.

For the first time at an American machine-tool show, presses of various sizes and types were on exhibition in quantity. The reason is that press builders as a group have become part of the National Machine Tool Builders' Association since the 1947 show. Always a spectacular feature of any show, the presses on display were notable for their speed and ease of operation as well as greater accuracy compared with previous models.

An unusual number of machine-tool builders showed working models of individual machines, automated lines or transfer-type machines in their booths. These models served as an interesting substitute for the finished product. They were used because (1) the machine or line had not actually been built yet, (2) the customer needed the machine immediately, therefore refused to take delivery after the show rather than before, or (3) the machine or line was too big to put into the space available. In a few cases, none of these reasons applied; the models were installed to attract the interest of the visitors to the booth.

SHOWS AT NAVY PIER AND COLISEUM

The Production Engineering Show at the Navy Pier, which ran simultaneously with the Machine Tool Show except that it ended a day earlier, was given over to the display of mechanisms, instruments, and equipment contributing to greater automaticity of industrial production and processing. It included, in its exhibits, electronic devices, air gages, conveyors, clutches and drive mechanisms, chucks, dies and jigs, lubricating systems and other products that are accessories to the operation of machine tools. These products were grouped in a separate show because of space limitations at the Machine Tool Show itself.

A third show, known as the Coliseum Machinery Show, was staged at the Coliseum in Chicago during the same period. It had no official connection whatsoever with the other two exhibitions. Its exhibitors consisted of companies not qualifying for the Machine Tool Show or the Production Engineering Show. Foreign-made machine tools, particularly Italian and German, were among the products on display at the Coliseum.

An Engineers' Sketchbook of the Shows

Biggest of US industrial shows, the Chicago triumvirate also were the most crammed with ideas. Here was a waterfall of data after eight years of no-show thirst. To distill out the best for your files , we had seven editors there the first week, five the second. Here is a roundup, in sketches and words, of their findings. It is admittedly incomplete, because even 12 man-weeks weren't enough to cover everything. After a while, impressions on the brain are short-circuited by those on the feet .

Our general impressions are a kaleidoscope of men asking questions??, peering under and into things, stopping and starting, while booth attendants become hoarse and grow bags under their eyes . And the visitors carry shopping bags (courtesy Socony) loaded with bulletins, catalogs, and the inevitable loot . Their lapels sport roses (artificial), their pockets red bandannas (real - courtesy Sheffield); they peril bystanders with unaccustomed canes (courtesy Cincinnati Shaper). And they form queues like Europeans whenever they think some thing will be theirs once it's done

Automation, ceramic tools, numerical control, self-resetting, and a host of detail improvements are there. We have done our best to recreate them here for your permanent record.

THE EDITORS

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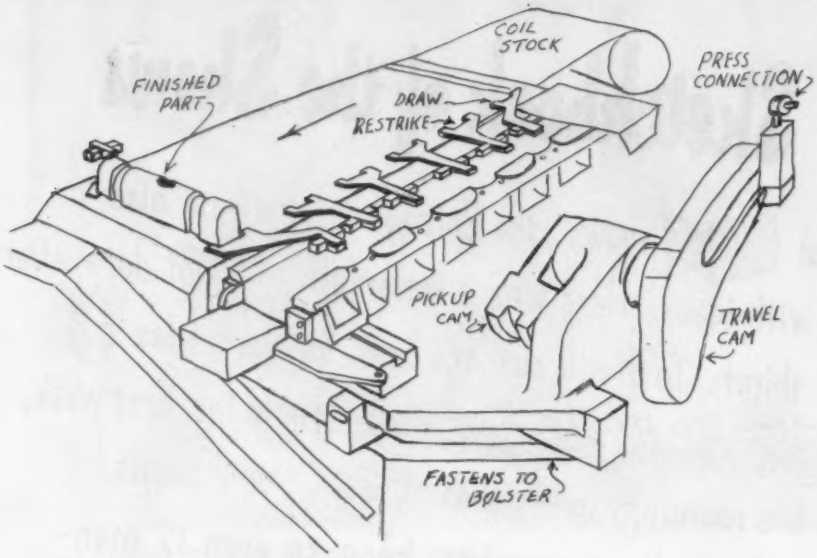


Devices Mechanize a Press

Any wide straight-side press of 8- to 20-in. stroke can be converted economically to a transfer press by transfer devices (Sheffield Contract Service Div). Two of these all-mechanical mechanisms are fastened to the press bolster, one at front and one at rear. They obtain power by connection to the press slide or drive. Two cams with adjustable pitmans actuate the transfer mechanism. Degree of adjustment is such that perhaps 99% of jobs can be moved progressively through die stations at 6- to 36-in. centers. One cam operates a scissors mechanism that causes the transfer fingers to be advanced to the workpieces, stay with them during the transfer movement, then retract out of the way during press closure. The other cam causes another scissors mechanism and double-rack system to move transfer fingers the desired pitch distance. Each device can be unbolted quickly in case of die trouble or change of product. For a new panel, the only change necessary is to make a new set of aluminum fingers and to adjust cams

"Packaged Presses" Have Arrived

The trend toward the "packaged press" is firmly established. A number of makers (Bliss, Clearing, Danly, Hamilton, Minster, Niagara) exhibited presses ready to run after they are set down on the shop floor and plugged into air and electric lines.

There are definite reasons why the packaged press is attractive, especially to mass-production users: (1) the hidden cost of setting up a conventionally equipped press may run to 35 or 40% of machine cost, (2) the press builder properly engineers the controls—air, electric, automation—puts them in substantial cabinets and properly labels the elements and functions, (3) electrical devices are prewired, and (4) final installation represents better value for the money because it is less subject to downtime and maintenance troubles. Large plants report their actual daily production of stampings is higher from the new streamlined packaged presses than it is from equally fast conventional machines, because labor instinctively prefers the more modern looking, "better-dresesd" units.

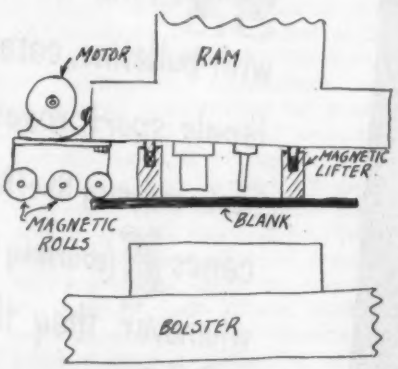
However, a large portion of industry may not be able to afford packaged presses with automation controls and extra-quality features common to JIC recommendations. For such plants, the more usual type of machines now constitutes the "economy line", although here too press builders are adding features like better clutches, lubrication, controls and adjustments.

JIC Recommendations. Packaged presses have a similarity in appearance and features, probably because of JIC recommendations for such matters as automation, lubrication, electrification, tooling space, also because several machines were reportedly built for Fisher Body to these specifications. It is fair to say that at one time JIC was resisted as being an interference in the press-builder's business, but that feeling has now abated and some builders pride themselves on exceeding JIC.

In essence, JIC has as its purpose the reduction of maintenance, the provision of greater safety and standardized tooling space so dies can be exchanged readily without butchering. Let's see how the press builders have translated these concepts into engineering advances of very real value.

Boxed-in Columns. Columns now perform two functions: to support the crown and take the stresses, also to inclose automation, electrical, air and other control circuits, plus oil reservoirs, pumps, filters. The result is both functional and esthetic.

Clutches. Over the years, scores of clutch designs have been developed, but there is certainly no lack of ingenuity now in devising new designs for better wear and operational characteristics. For example, the clutch on one inclinable press (Bliss) is a compact, crankshaft-mounted, air-friction design that eliminates wear and needs only a single valve for operation. In another case (L & J), the air clutch on a high-speed straight-side press is placed on the backshaft to avoid design restrictions, and to provide better air-filling characteristics. In this case, six pinholes are put into the flywheel to avoid wear on localized gear teeth as when single-hole engagement is used. The gear can be loosened and rotated to bring another engaging position into use, thus distribute wear. An air clutch on the rear of the high-speed shaft of an OBI press (Niagara) is



Automatic Press Unloader

Faster and safer feeding of blanks to piercing and notching setups are achieved by an "automatic hand" (American Actuator). The operator feeds blanks as fast as he can to gages in the tool, and after the press stroke the part is taken automatically to a conveyor, stacking device or chute. The automatic hand consists of two elements—magnetic lifters attached to the ram or punch holder to lift the piece, and magnetic-powered rollers that convey the piece to the side of the press

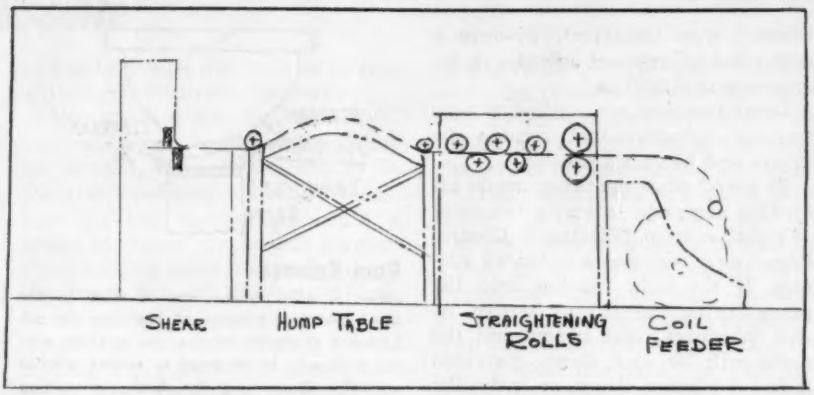
featured, because the crankshaft is placed front to back.

Fruitful attention has been paid to the problem of how to get suitable drawing speed on a mechanical press without slowing down non-working parts of the cycle. In one design (the Clearomatic by Clearing) the ram is slowed down during drawing to about one-third the crankshaft speed, but the ratio is adjustable to suit job-shop needs. The arrangement incorporates planet and sun gears and high- and low-speed clutches. As soon as drawing is completed, return stroke occurs at accelerated speed. Actually the clutch is designed so it can be operated in high speed, in low speed, or in the combination of speeds cited, and besides the position of the slide at which speed change occurs can be varied. When operated for a day's run the loss in production is relatively unimportant as compared to the flexibility.

An air-friction, shoe-type clutch (Hamilton) has four diaphragm cylinders that move the four shoes radially outward to engage the clutch; spring pressure retracts them against the brake when the air is exhausted from the cylinders. There is no overlapping between these functions. The low-inertia design allows for clutching and declutching at speeds almost equal to that of the press when running continuously. When the press is being inched, torque is low, and if the press should become stuck at bottom stroke it is stuck only with low clutch torque and is readily unstuck.

Two-speed drives are featured in OBI and straight-side high-speed presses (Minster). The OBI operates at 200 or 400 strokes per min, and is equipped with a double-roll feed and scrap cutter. In the straight-side press, 22 or 33 strokes per min are secured by drive adjustment. The flywheel is placed on the high-speed jackshaft so a considerable change in flywheel speed will not adversely affect clutch life.

Lubrication. Force-feed lubrication and many refinements to protect the press in case of lubrication failure are prevalent. All principal bearings in certain presses (Hamilton) are now supplied with a splash feed as well as force feed, so the press will not have unlubricated bearings if one or more pressure lines are plugged and not immediately taken care of. Normally a warning signal lights and the pressure switch stops the press. But if the pressure switch should fail, splash feed carries on.



Shorter Hump for Shear Line

Shearing or blanking at 225 strokes per min, instead of the conventional 60, both boosts production and reduces the shear-line length—from a normal 40 to 60 ft to about half that much. The hump required is very short. Stock is held only 1/6 sec; accuracy is normally 1/16 in. per ft, and product has minimum twist and camber. High-speed shear (Wysong & Miles) can be used in mass-production plants, and can be hooked up with automation to feed blanks and strips to presses. Machine has capacity of 14 gage by 48 in.

If low oil pressure occurs in a high-speed press (L & J 450-spm straight-side), a pressure limiter shuts down the press. In addition, if the temperature of the pitman and crank bearings should go above 150 F, the press is shut down.

Oil draining from the gibs is caught on the upper surface of the ram, particularly in flange-ram designs, and flows down a spout into a sump.

If an oil line is plugged on another line (Danly) a multiple-pressure limit switch, one element per line, disengages the clutch.

A self-lubricated die cushion (Minster) avoids wear. Separate drains for lubricant and drawing compound avoid contamination.

Other Controls. The types of controls used on presses, especially the packaged variety, are of almost endless variety. In many cases, one control is set to watch another, so that if it fails the machine will not be damaged—there is another chance to stop it.

Automatic controls on a high-speed press (L & J) aid threading stock. The press is slowed down just before a strip runs out and again during starting of a new strip, so pilots will not be broken.

Rotary limit switches are used by several builders (including Niagara and Danly) to be tied in with automation. Outlets are provided on the column in several cases to supply air for automation devices, die grinders, etc.

Electrical controls are placed in oil-tight cabinets in the columns.

An adjustable feed-line height (Minster) is applied to the feed and scrap cutter. With this arrangement, it is unnecessary to use loose pieces under dies of different heights. A limit switch prevents press operation if the feed-line height has been adjusted, but the throw of the feeding arm or scrap cutter has not been adjusted.

Press Inclination. OBI presses are becoming very large. To incline one of the new "monsters" might take a half a day if done by hand. By pushing a button, a drive will incline a 110-ton press (Minster) about 25° in 3 min. Bliss has a motorized drive too, and Niagara has a hydraulic arrangement for the same purpose.

Safety. Both the press and its tools (as well as the operator) have been considered in respect to new designs.

New to many at the Show was the use of fluorescent lights, circular or straight, in the columns or throat of the press, so the operator can clearly see the dies at all times. This feature is a great help during maintenance and die setting.

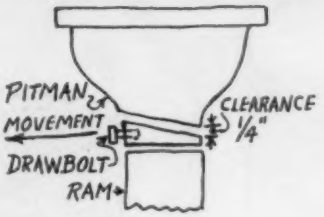
A pressure-checking device (L & J) incorporates a hydraulic cylinder and a pressure gage with two indicator hands — one that shows the pressure instantly and the other which stays to show the maximum pressure that has occurred. This device, only 2⅛ in. high, can be slipped into many setups to check pressure for forming, punching, etc, to avoid press overloads. It is sensitive enough that sheets of paper, after being compressed a few times, will cause a sharp tonnage rise. Therefore, the die setter is made aware that a very slight change in adjustment can easily overload the press.

The problem of fine adjustment of the die slide has been approached in

another way (Minster), wherein a motorized adjustment operates in increments of 0.0005 in.

Limit switches are applied to control air cylinders that actuate die lifters and kickers (Minster).

To speed press operation while affording complete safety, a "curtain-of-light" control (Electronic Control Corp) now features a balanced system. If the man reaches into the press during the closing stroke, he will interrupt light beams and the press will be shut down, provided it has a friction clutch or hydraulic drive. Light sources are "balanced," so that malfunctioning or tampering cannot occur without a shutdown of the machine—press, shear, etc. With no need to use two-hand control, operation of the equipment is speeded up considerably, and the operator can do additional chores.



Ram Release

When a press brake ram is stuck in the down position, because of improper die adjustment or double blanks, the machine cannot ordinarily be returned to service without partially dismantling the brake or cutting out the dieholder. But a new ram release of the wedge type (Lodge & Shipley) allows the shop to free the eccentric in a few minutes. Top angle of the steel wedge matches angle machined on pitman or ram-adjustment socket housing. Adjustment screws allow wedge to be pulled out to gain ¼ in. clearance, so dies can be released.

SMALL PRESSES

Progress is being made in the small-press field too. Shut height and heavier flywheels (Famco line) enable heavier jobs to be handled. A solid clutch-jaw insert is now used in the flywheel instead of a pin to avoid breakage on 6- and 8-ton models, and an Electromatic clutch is employed on a 10-ton press to avoid repeats arising from mechanical failure.

Production air presses (Famco) are designed in sizes up to 10 tons to give controlled speed and sustained pressure throughout the stroke when staking, marking, forming and assembly.

A "servo control" on a bench-type hydraulic press (Denison) gives sensitive application of pressure when pressing bushings and straightening. The same builder has speeded up dial-feed hydraulic presses 35 to 40%, attaining about the maximum speed that can be hand fed.

A hydraulic pumping system with booster enables the use of up to four or so piercing or riveting guns. The development of the power unit (Danly) enables a shop to carry on a relatively high amount of plate work and assembly operations noiselessly and under quality control in a relatively small area.

Threading strip through high-production press lines may take twice as much time as to use up a coil—say 30 min. of preparation and 15 min. of actual stamping. Now there is a huge machine (Morton) that butt-welds the ends of coils together and scarfs the weld so threading time is reduced to about 2 min. This machine will weld silicon steel as well as strip of other metals, and it will be possible to feed strips or blanks from the side for welding to the main strip, in order to obtain desired grain orientation.

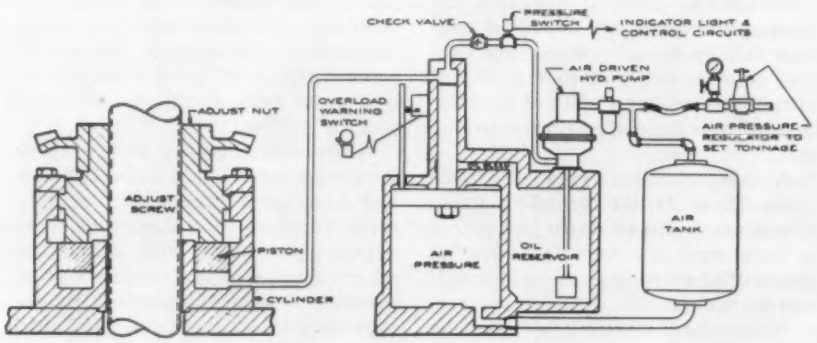
Tapping in Multi-Slide. Normally a multi-slide machine (US Tool) is operated about 110 strokes per min. But with a tapping attachment placed between cutting and forming stations, a second operation is saved, although production speed must be reduced to say 65 strokes per min. Even so, this loss is economically feasible. The attachment is driven from the machine camshaft and can be positioned to tap on or off center of the strip.

A hydraulic bar cutter (Buffalo Forge) of upstroke design will cut off 2¼-in.-dia slugs so square and clean that it would seem to be a good method of making blanks for cold extrusion.

FORGING EQUIPMENT

A big saving can be realized by using coiled hot-rolled bar in nut-making machines instead of wire, because of the relative cost of these two forms of material. A wire feeding and drawing unit that will reduce the bar as much as 0.050 in. and of course straighten it was shown (National Machinery). A bolt maker has an attachment to assemble washers before thread rolling. And the same maker showed a nail machine that turns out two-penny nails twice as fast—1200 per min.

As a stunt, perhaps, one 3-in. forging machine (Ajax) was rigged up with an induction heater and an automation device to transfer the heated bar through several die impressions. The bar (one end heated) was dropped into a chute with tripper arrangement to let one bar fall per cycle. From this point the bar fell into multi-impression tongs recessed into the die blocks behind the impressions. At each stroke, the tongs, given an oscillating motion, opened and rolled the bar down to the next lowest die impression. It's likely that few forge shops will have a machine running continuously, but where automation of this kind can be used the forging output can probably be increased three-fold.



Press-Overload Protection

Protection of mechanical presses against overloads caused by material too thick or double blanks has been solved by insertion of a cylinder and intensifier between the ram-adjusting screw and nut (Clearing). If the pressure during the last ½ in. of stroke exceeds the preset tonnage, the adjustment unit compresses or lifts so the overload cannot break ram or tools. The slide will be stopped but the drive will continue past bottom stroke to avoid sticking the press. As the ram goes up, pressure in the system drops because oil has been bled into a reservoir. Consequently, a pressure switch trips out, disconnecting the operating button, so the press clutch disengages at top stroke. Also lights change from green to red and a bell rings to signal the need for a check by operator or supervision

Faster Broaching Possible

Higher speeds, substitution of electro-mechanical for hydraulic drives, improved designs that permit easier control of machines as well as reduction of time lost between cutting strokes, and developments that insure better quality of surfaces finished by broaching were in evidence. Automatic loading and removal of workpieces also were shown.

A new use for the broaching process was shown in the "Scru-Broach" announced by Ex-Cell-O. This novel machine combines broaching and tapping processes to cut precision fast-lead threads in large nuts at high production rates. It was demonstrated cutting special - form threads of approx 9/16-in. pitch in 1 1/16-in. ID steel nuts for steering-gear ball units. Now made in one- and two-station models (it is rumored that a four-station unit is "on the boards"), this machine uses tap-like roughing and finishing cutters to generate internal threads in two operations. Each cutter is rotated and fed through the work at 50 rpm with a motor-driven leadscrew.

Also unusual was the "One-Way" vertical broach exhibited by Colonial Broach. This is claimed to be the first broaching machine for surface-finishing operations to use a series of "rams" or broach carriers on an endless chain that moves down the front face of the vertical column, and returns up the rear face —much as the segments of a band file are traversed. The broach carriers enter precision ways before they reach the broaching position, to guide broach teeth accurately past the work.

A feature of the design is an arrangement which permits increases in stroke length up to 200 in. Chain carrying the broach slides is driven at 10 to 50 fpm by an infinitely adjustable mechanical drive powered by a 25-hp motor.

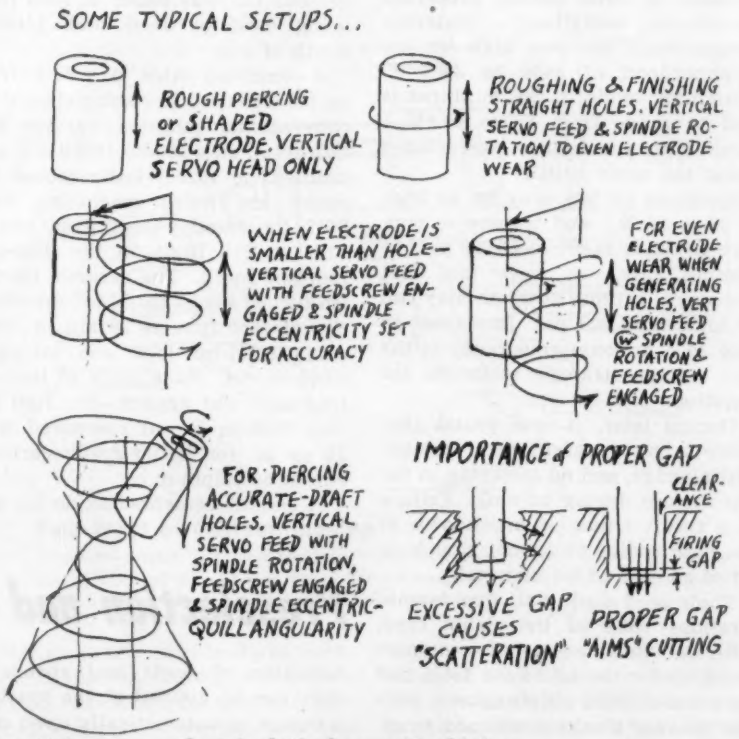
A twin-ram American vertical internal broach of 50 tons capacity, with 72-in. stroke has an unusual arrangement of twin lead bars for each ram to make possible full support for each broach throughout its cutting stroke. This helps minimize chatter. A 100-gpm magnetic coolant separator multiplies tool life 3 to 4 times.

Surface and internal broaching at speeds up to 300 fpm was demonstrated by Lapointe, with vertical and horizontal machines equipped with electro-mechanical drives. Design of these machines has been improved to simplify controls, increase workhandling efficiency, and speed production. These machines, as well as the improved tunnel-type continuous-chain broaching machines exhibited by Lapointe, can be equipped with hopper feeds or other automatic loaders. Fixture supports in the continuous - broaching machines have been improved to eliminate binding as the tools pass over the sprockets at either end. This eliminates an important cause of cyclical variations in pull on the chain.

Electrical-discharge Machining

Reports of 5000 electrical-discharge machine tools now in use in the Soviet Union contrast sharply with our first Show exhibits of units other than tap disintegrators. Cincinnati Mill showed the Elektrojet for tool sharpening, surfacing, forming, piercing, die-making, or polishing. One model has a "universal" head (Elox), the other a turret with Elox head on one side and vertical mill on the other. The latter can also carry circular electrodes for discharge surfacing with servo-mechanical table feed and automatic depth control. A forthcoming machine, with horizontal geared head for 12-in.-OD circular electrodes replacing the vertical head, will do form surfacing. A 4-station Elektrojet pierced 32 elliptical holes in stainless in 110 min, with extruded tubular brass electrodes. Contour was held to 0.005 in., alignment to 0.001 in.

Firth Sterling showed the MeX Grind at the PE Show. Developed by Method X Co (Firth Sterling affiliate) the unit has a cast-iron wheel for offhand sharpening of single-point carbide tools. Electrical discharge from wheel to tool removes metal particles, which enter the semi-solid dielectric film. Wheel is adjusted from rough to finish "grinding" by a selector switch. Rapid metal-removal rates and low wheel wear and cost are claimed—the same CI wheel "cuts" both carbide and shank without change.


SOME TYPICAL SETUPS...
ROUGH PIERCING or SHAPED ELECTRODE. VERTICAL SERVO HEAD ONLY
ROUGHING & FINISHING STRAIGHT HOLES. VERTICAL SERVO FEED & SPINDLE ROTATION TO EVEN ELECTRODE WEAR
WHEN ELECTRODE IS SMALLER THAN HOLE— VERTICAL SERVO FEED WITH FEEDSCREW ENGAGED & SPINDLE ECCENTRICITY SET FOR ACCURACY
FOR EVEN ELECTRODE WEAR WHEN GENERATING HOLES. VERT SERVO FEED W/ SPINDLE ROTATION & FEEDSCREW ENGAGED
FOR PIERCING ACCURATE-DRAFT HOLES. VERTICAL SERVO FEED WITH SPINDLE ROTATION, FEEDSCREW ENGAGED & SPINDLE ECCENTRIC-QUILL ANGULARITY
IMPORTANCE of PROPER GAP
CLEARANCE
FIRING GAP
EXCESSIVE GAP CAUSES "SCATTERATION"
PROPER GAP "AIMS" CUTTING

Some Pointers on Electrical-Discharge Machining

Hole shape and accuracy vary with electrode motion, as sketched above. Firing rate is several thousand times a second (which would wear out a conventional sparkplug in a few minutes) so proper firing gap must be maintained if smooth, accurate machining is to be done (lower right)

Cemented-Oxide Cutting Tools

Ceramic or oxide tools cut at 600 to as high as 3000 fpm, with depth of cut ranging from 0.110 to 0.250 in., and feed rate from 0.008 to 0.016 ipr. When tools are designed properly, supported adequately, in a machine with sufficient power, rate of metal removal is at least four times greater than that obtainable with tungsten-carbide bits under the same conditions, and bits last 26 to 30 min. Bits properly designed remain cool—the heat goes into the chip. Power required is about the same as for tungsten-carbide tools.

Definite information about the new ceramic cutting materials is limited —the five U S companies now making bits experimentally do not want to divulge very much about ingredients nor processing procedures. However, one informant told us most of the bits are principally aluminum oxide (Al_2O_3), with varying percentages of other oxides, processed by powder metallurgy. Sintering temperatures are very high—in the neighborhood of 3400 to 3600 F. Aluminum oxide in the mixtures is said to range from 89 to 99.6%—those with the higher percentages being the more brittle.

Hardness of bits may be as high as 93 to 94 R_A, and transverse rupture strength 40,000 to 50,000 psi. In another case, we were told that transverse rupture strength may run as high as 85,000 psi. Important in case of a national emergency is the fact that no strategic materials are required.

During tests, it was found that there is no apparent wear on the cutting edge, and no cratering in the top surface during turning. Failure is a result either of breakdown of the nose radius or abrupt sloughing off of an area of bit material.

Tools used during all five demonstrations were of the clamp type, with a tungsten-carbide support block under the bit. Four tools had tungsten-carbide chipbreakers, with the breaker blocks positioned to direct chips so they would not inpinge on the cemented oxide bit as they moved at high speed away from the cutting area. In the fifth case, the breaker block was left off to provide an effective demonstration of the rate at which the chip is produced.

Carboloy, developing oxides since 1951, claims they will increase steel-finishing speeds four to five times when applied properly. Carboloy does not refer to its material as an *aluminum-oxide* ceramic, says it is not similar to other cemented oxides now available, and that it works best in the 1000 to 3000 fpm speed range. None of the oxides are as yet commercially available. It may be a year before test samples are obtainable.

A contoured part with 4-in. max OD and 2-in. min OD was turned with a Carboloy cemented-oxide toolbit under tracer control in a Model LE 18-in. Tray-Top engine lathe at the Cincinnati Lathe & Tool booth. Test logs were an alloy steel that "cuts like AISI 1040 steel." The ⅜ x ¾ x 3/16-in. bit was clamped in a specially designed holder arranged to support the bit with –5° back rake, –5° side rake, and 5° clearance all around the cutting edge. Nose radius was 1/32 in. The contour cut was taken at 1500 fpm, using 0.005-ipr feed and 1/16-in. depth of cut.

A cemented oxide ⅜ x ¾ x 3/16-in. bit was used in combination with conventional tungsten-carbide bits in a setup on a Model 10B-6½ J & L saddle-type turret lathe tooled for rough and finish machining SAE 8647 forged-alloy-steel gear blanks (197 to 217 Bhn) in the Jones & Lamson booth. The ceramic bit finish-turned the 12-in. OD of the blank dry at 1950 fpm, to 20 mu in., rms, using 0.011-ipr feed and taking a 0.060-in. cut. Rake angle at the cutting edge was approx –5°. Tool life was 1500 sq in., as compared with 10 sq in. for better-grade carbides run at 800 sfpm dry.

A similar cemented-oxide bit was used in Monarch's booth to finish-turn a 1½-in.-OD steel shaft and face an integral 8-in.-OD flange at 2000 fpm, using 0.0065-ipr feed and 0.032 to 0.062-in. depth of cut. This cut was taken after the forged shaft had been rough-turned and faced with a conventional tungsten-carbide tool. Both cuts were taken in a new Series 1000 Monarch 13-in. precision engine lathe equipped with preselection and constant cutting speed controls.

In Warner & Swasey's booth, a 22-in.-OD test log of AISI 1040 forged steel was finish-turned in a new Model 4A W & S hydraulic-head turret lathe at 2200 fpm, with 0.003-ipr feed and 0.060-in. depth of cut, using a Carboloy bit.

A 32-in. heavy-duty engine lathe driven by a 125-hp motor was used in the LeBlond booth to rough and finish turn 17-in.-OD test logs of AISI 1045 forged steel. Equipped with infinitely adjustable control of spindle speed from 42 to 1400 rpm, this lathe took finishing cuts at 2500 to 3000 fpm, with 0.0065-ipr feed and 1/16-in. depth of cut, using a Carboloy oxide bit. This cut required approx 27 hp.

In each case, finish achieved was very smooth, considering the feed rate, and there was no evidence of "fuzz" on the finish-turned surface that would have been caused by dulling of the cutting edge—even after the tool had been used for a good many cuts. Tool geometry is an important factor in successful application of cemented-oxide cutting tools—and adequate clearance around the cutting edge appears to be essential.

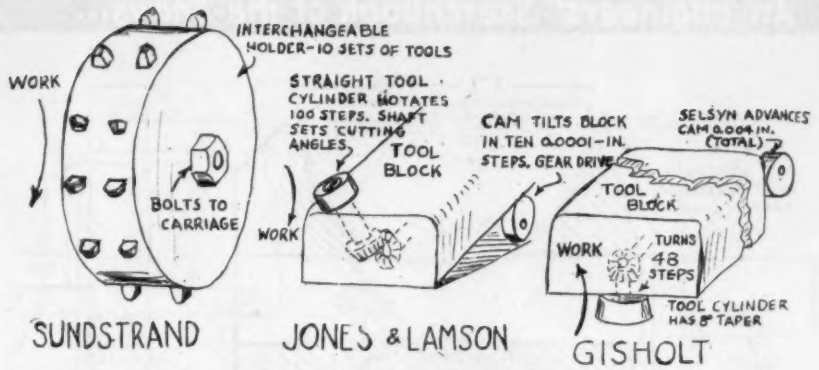
Preselection and Numerical Control

Selection of feeds and speeds so they can be applied at the touch of a button or automatically upon completion of the previous operation was a widely applied technique. Methods ranged from a simple card placed over the change-gear lever (which merely indicated the next setting but was numbered for the operation), to a fully automatic tape-controlled machine that produced three different parts alternately from a single loop of tape which determined speed, feed, length of cut, and operation sequence.

Fosdick and Cincinnati-Bickford showed radial drills in which the speed and feed for the next cut can be set while the previous cut is underway, then pressing a button actuates the next selection. Carlton has a system on its radials that permits preselection and programming of as many as 20 or 30 combinations of feed and speed. Each time the button is pressed the next change

takes place. Monarch showed a numerical-sequence programmer that uses one large punched card (which can be punched in the shop or office in direct decimal numbers), that is placed over a panel of buttons. Pushing a pin through the holes sets the buttons, or a master pin-plate accomplishes the same thing. This panel will sequence 25 functions and select from 8 different combinations of feeds and speeds, preset on dials. Operation is electric.

Numerically controlled table positioning was shown by Arter, Bullard, Farrand, Fosdick, Hillyer, General Electric and Wiedeman. The latter was a tape-controlled turret punch using a system newly developed by the press builder. Most of the control systems are designed to permit operation by tape, button, or dial setting, as well as punched cards. Case Institute and Giddings & Lewis described machines with motions coordinated to produce angles, curves, etc.

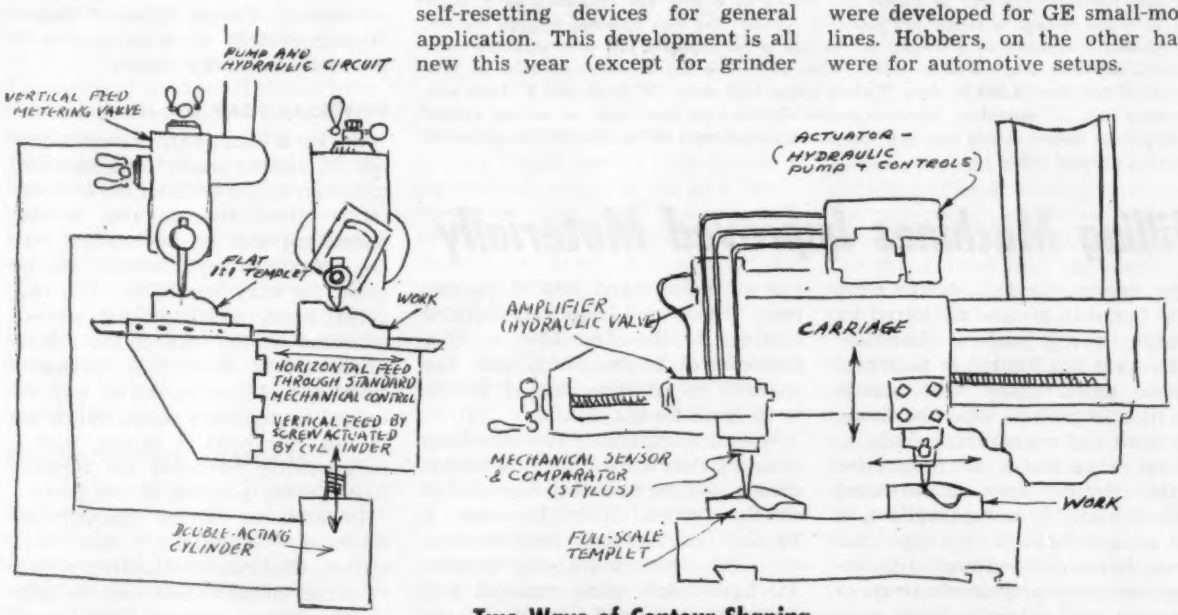


How Three Lathes Reset Their Own Tools

All jobs are GE motor rotors or armatures, hence constant-diameter cylindrical turning. Use of an indexed circular toolbit, while known for years, is still relatively uncommon, and controlled rotary indexing of such a bit is new. On the Gisholt, there is an adjustment for bit resharpening; the J & L bit is inverted for a second 100 indexes, then discarded

Self-resetting Moves In

At least three lathes and two hobbers equipped with self-resetting or feedback equipment were shown this year, plus a process controller applied to two grinder lines, and two self-resetting devices for general application. This development is all new this year (except for grinder automatic gaging), the first unit having been described this Spring (*AM* —Mar 14, '55). Lathe units are compared in an accompanying sketch. It is interesting to note that all three were developed for GE small-motor lines. Hobbers, on the other hand, were for automotive setups.



Two Ways of Contour Shaping

Cincinnati shaper (left) and Rockford (right) both use hydraulic circuits as sketched here. Cincinnati, on a shaper, has a flat 1:1 templet, as does Rockford on a planer. In each case, only one motion is controlled—vertical

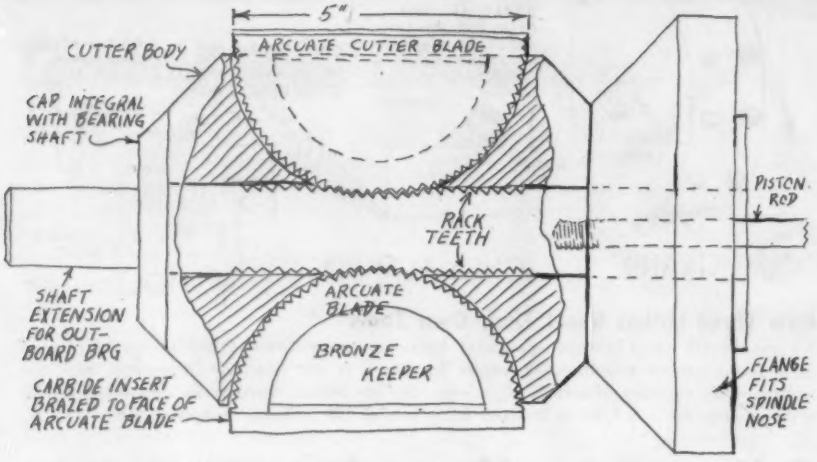
Planing & Shaping

Giddings & Lewis, Gray, and Rockford all showed planers capable of about 400 fpm—in sharp contrast to speeds of about half that at the Show eight years ago. It is interesting to note that, as of now, no tools are available to plane steel at above about 300 fpm, or cast iron at above 200 fpm — one case in which machines outdo available tools. The speeds are, however, available for cutting non-ferrous metals now, and steels when the cutting materials are available.

Many improvements have been made in machine details, drives, and controls. Rockford, for example, now has all controls in the pendant, and can change speed during the cutting stroke if desired. Gray has provided a socket between clapper box and rail so a 2-way toolpost can be inserted. A motor on the head rotates the post to give each bit in turn proper clearance.

Among shapers, the most spectacular was the new Cincinnati 48-in. all-steel, which has a heavy triangular ram which is all bearing surface, providing speeds up to 400 fpm without cocking or "jump." It is driven by a screw and nut. Also, controls can be shifted from one side to the other, as desired.

Only one slotter, or vertical shaper, was shown—the Rockford, and two keyseaters, the Mitts & Merrill and a new Bliss unit, recently purchased and redesigned.



Flutter Cutter Changes Taper As It Goes

At least two tracer controls are usually required to mill progressively changing contours on top faces of aircraft wing spars, etc, because the spindle housing must be repositioned as angular relation between spindle and workpiece changes. Tool engineers at Cincinnati Milling now have developed a 6-in.-OD "flutter" cutter whose included angle of taper can be changed continuously from zero to 20° either way. Each blade is lapped to fit in a slot milled in the cutter body, is held in place with a bronze keeper, and has teeth on its arcuate side which mate with the rack. The pair of blades are moved by a rack bar controlled by a single hydraulic tracer through a selsyn and hydraulic cylinder. The rack operates through the machine spindle, is actuated by a templet on the side of the table. In this case, a contour with horizontal centerline was milled on a 3-in.-wide, 36-in.-long bar of aluminum alloy at 1200 rpm and 30 ipm feed, 0.050 in. deep. Carbide edges had about 10° hook and 8° helix with 8° primary and 12° secondary clearance angles. Cutters have been used on various vertical and horizontal millers; in this case one was demonstrated on a 30-hp 430-184 Hypowermatic bed-type Cincinnati miller

Milling Machines Improved Materially

Major improvements in design were to be found in millers exhibited by virtually every maker. Improvements were not limited to high-production units. They will benefit operators of jobbing machine shops, toolrooms and maintenance shops, as well as large and small production plants. Entire lines of so-called "conventional" knee-type millers, as well as the heavier bed-type machines, have been redesigned to improve accuracy and convenience of operation, and to make them more powerful and rigid for effective use of carbide milling cutters at optimum cutting speeds and feeds.

For example, the new dial type knee-and-column millers announced by Cincinnati are 50 to 80% more powerful than previous designs and have a wider range of speeds and feeds. Spindle speeds now range from 18 to 1800 rpm for the No. 2 sizes of plain, universal and vertical models, and 16 to 1600 rpm for the larger Nos. 3 and 4 sizes.

Speed changes are accomplished quickly by operating "increase" or "decrease" pushbuttons on a control console on the front face of the knee, and on the lefthand side of the column. Start and stop pushbuttons also are in these consoles, as is a feed-control knob—which aids the operator in selecting any of 32 (⅜ to 90 ipm) feeds quickly.

With the addition of two new lines of heavy-duty knee-type milling machines, and the updating by redesign of two older lines, Kearney & Trecker now has four complete lines of modern general-purpose millers. All have been made stronger and more powerful, with centralized controls and other time-saving features. The two heavy-duty lines have two support screws under the knee for more rigid support of the heavier tables and larger workpieces.

Van Norman Co also has redesigned its entire line of milling machines — they now are some 40% heavier, more rigid and more powerful, are easier to operate, and have wider speed and feed ranges, to permit more effective use of carbide cutters. Virtually the same thing can be said for Kempsmith Machine Co, which exhibited a new-from-the-ground-up "Master-Mill" in plain and universal models, and for Greaves Machine Tool Div of J A Fay & Egan Co. Virtually every maker of milling machines displayed new designs of vertical and universal-head models which will speed toolmaking operations.

Both Cincinnati and Greaves exhibited new motor-driven toolmaker's overarm attachments for plain and universal knee-type millers. In each case, the spindle head can be positioned at any required angle or swung up out of the way. A somewhat similar attachment was exhibited by Maserati Corp of America at the Coliseum Show. Made in Italy, this new unit is powered with a 2½-hp motor.

Every maker of milling machines apparently has developed a ram-type universal miller for the tool and die maker—or a machine that can be used conveniently for the same range of operations. It hasn't been so long since these units could be purchased from only a handful of makers. Seven different makes (two imported) were on display at the two machinery shows.

UNIVERSAL HEAD ON JIB

Brown & Sharpe announced a new No. 20 sliding-head "Rangemaster" toolroom miller with which horizontal, vertical and angular milling operations can be performed with one work setting. Controls are located for easy operation. The universal head, which quickly can be mounted on the face of the sliding head, drives from the horizontal spindle, and can be set to any required angle in any plane. When not in use, this head is swung, with a permanently mounted jib support, to a storage position at the side.

In addition to its recently announced "Toolmaster" ram type miller, Cincinnati exhibited a new "Contour-master" tool and die miller for small and medium work. Equipped with an hydraulic automatic depth-control tracer, this machine will accurately trace contours of master shapes and templets.

Famco Machine Co and George Gorton Co exhibited new-from-the-ground-up ram-type millers which can be equipped with table and saddle power feeds. A slotter head can be mounted on the rear end of the turret ram on the Gorton machine.

A new "Quartet" turret-type milling machine exhibited at the Coliseum by The U S Burke Co has a horizontal spindle in one face of the turret, and a vertical head on the other end of the overarm. It is

claimed that, within its range, this miller can perform any milling operation. In the same show, South Bend Lathe Works displayed a new vertical mill with a motor-powered head adjustably mounted on the end of a 4½-in. OD horizontal ram.

Pratt & Whitney showed a completely redesigned BL-3622 Model C Keller automatic tracer-controlled miller. It now is driven by a 10-hp motor (previous model used a 3-hp motor) and is claimed to be at least 25% faster. The spindle is designed to operate all the way through the 30 to 3600 rpm speed range—previously spindles had to be exchanged between high and low ranges.

Makers of bed-type production millers also have beefed up their designs, made them more rigid and powerful, put in larger motors, and regrouped controls for greater convenience.

Kearney & Trecker exhibited a new "Mil-waukee-Mil" Simplex production miller that has a 20-hp spindle drive motor to provide speeds of 22 to 900 rpm with 16 changes. The machine has an automatic backlash eliminator, automatic quill retraction, and can be equipped with automatic rise-and-fall spindle heads. Kent-Owens and Motch & Merryweather also announced new bed-type production mills with heavy-duty spindles which can use carbide milling cutters effectively. The M & M unit features automatic electrical control and 84 spindle speeds from 25 to 1230 rpm. Backlash adjustment is outside the bed for easy change by the operator.

RECONDITIONING DIEBLOCKS

An improved Model 77 heavy-duty dieblock miller with a horizontal spindle in the Sundstrand booth demonstrated latest methods in reconditioning used forging dieblocks. Not so many years ago, used blocks were sold as scrap—because it cost too much to recondition them. Time for milling a matching set of 16 x 16 x 12-in. blocks, including removal of old impressions, was less than 4½ hr when cutting 429-Bhn hard blocks at 120 fpm, with ½-in. depth of cut and 8-ipm feed. A 10-in.-OD carbide face mill was used, and most of the cuts required the full power of the 50-hp motor.

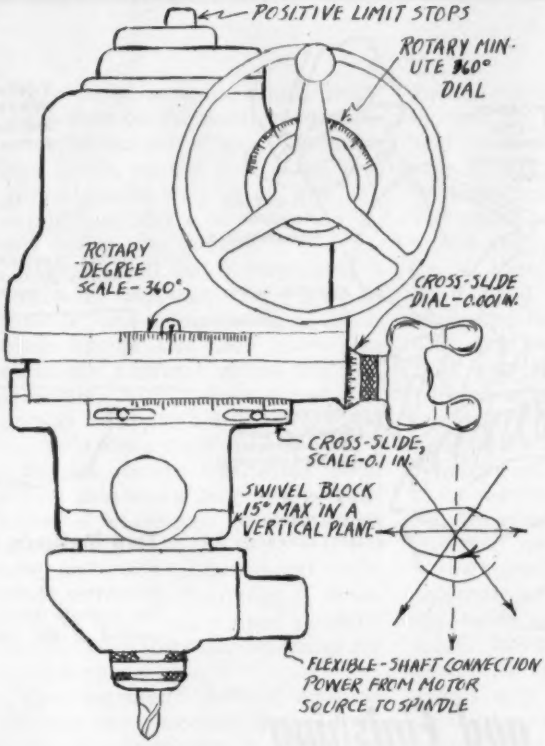
New planer-type millers exhibited by Giddings & Lewis and G A Gray Co featured easy precision adjustments of spindle tilt for matching lapping cuts, as well as heavier, more rigid designs, simplified and centralized controls, and more powerful spindles. All controls for the vertical milling head are in the pendant pushbutton station of the 36 x 96-in. openside "Handymill" demonstrated by Gray. This machine uses 25-hp motors to drive individualy the vertical milling head and the horizontal boring head.

The new 72 x 72 x 288-in. planer-type double-column miller demonstrated by Giddings & Lewis has two vertical heads on the rail and two side heads—all individually powered by 50-hp water-cooled motors, and spindle speeds from 9 to 500 rpm in 24 steps. In test cuts taken before the machine was shipped to Chicago, metal-removal rate from AISI C-1018 forgings with carbide cutters was as high as 1.5 to 1.6 cu in./min/hp, which is believed to be something of a record. Such heavy cuts could not be taken in Chicago, because of power-supply limitations.

In one demonstration, a 6-in. OD, 10-in. long helical slab mill with preformed and sintered Carboloy 370 carbide blades brazed in the hardened tool-steel body was used in a 3210 CSM Simplex bed-type miller by Kearney & Trecker for facing off the top surface of AISI 8620 steel blocks (200 Bhn hardness).

The 9¾-in. wide, 24-in. long cuts were 0.010 in. deep, and were taken at 178 rpm with 50-ipm feed, using climb and conventional cutting procedures alternately as the table moved from end to end of the bed. Power required averaged 50 hp. Despite the difficult cutting conditions, the cutter averaged 60 cuts per regrind. No cutting fluids were used. The test proved that carbide-tipped slab mills can be made to take good-sized cuts without chatter.

Line-tracer control (Cincinnati) facilitates the machining of mating parts to close tolerances (push fit) from a full-scale line drawing in one setup. A light beam transmits information to an electronic hydraulic system which controls movement of table direction to a thousandth of an inch. Male and female parts are produced from a single drawing. Irregularly formed parts, templets, gages, forming and cutting dies, and male and female dies are machined to accuracies providing a slight press fit, minimizing hand finishing.

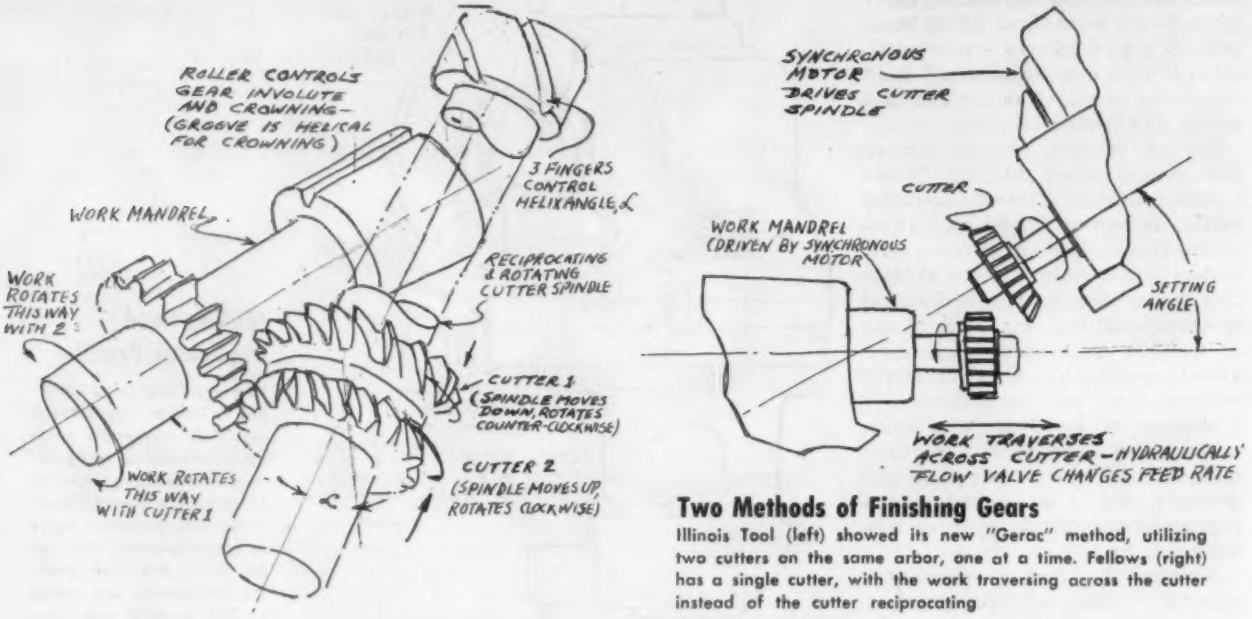

POSITIVE LIMIT STOPS
ROTARY MINUTE 360° DIAL
ROTARY DEGREE SCALE - 360°
CROSS-SLIDE DIAL - 0.001 IN.
CROSS-SLIDE SCALE - 0.1 IN.
SWIVEL BLOCK 15° MAX IN A VERTICAL PLANE
FLEXIBLE-SHAFT CONNECTION POWER FROM MOTOR SOURCE TO SPINDLE

Milling Head Duplicates Pencil

Rotary milling head (Kearney & Trecker) duplicates in metal all movements made by draftsmen in preparation of a working drawing. Operator can generate practically any geometric figure in plane geometry that can be constructed with drafting instruments, has speeds of 250 to 4000 rpm. Contour milling, die work, odd-shaped male cores, special cutters, die cavities and the like are done with it

Now . . . Computers

At both the Amphitheatre and the Navy Pier, Carboloy had its new machinability computer available for tryout by visitors. The unit, announced earlier this year (*AM*—June 6 '55, p189), was quite close to magic, according to several qualified visitors who tested it. Simpler computers—really calculators for feed, speed or surface feet, given any two, are now built into several machines.


ROLLER CONTROLS GEAR INVOLUTE AND CROWNING—(GROOVE IS HELICAL FOR CROWNING)
3 FINGERS CONTROL HELIX ANGLE, ∠
WORK MANDREL
RECIPROCATING & ROTATING CUTTER SPINDLE
WORK ROTATES THIS WAY WITH 2
CUTTER 1 (SPINDLE MOVES DOWN, ROTATES COUNTER-CLOCKWISE)
CUTTER 2 (SPINDLE MOVES UP, ROTATES CLOCKWISE)
WORK ROTATES THIS WAY WITH CUTTER 1
∠
SYNCHRONOUS MOTOR DRIVES CUTTER SPINDLE
CUTTER
WORK MANDREL (DRIVEN BY SYNCHRONOUS MOTOR
SETTING ANGLE
WORK TRAVERSES ACROSS CUTTER—HYDRAULICALLY FLOW VALVE CHANGES FEED RATE

Two Methods of Finishing Gears

Illinois Tool (left) showed its new "Gerac" method, utilizing two cutters on the same arbor, one at a time. Fellows (right) has a single cutter, with the work traversing across the cutter instead of the cutter reciprocating

Gear Cutting and Finishing

Fellows exhibited a line of transmission-pinion shapers. Blanks were automatically delivered to the machines from vibratory hopper feeders and, after being shaped, gears were checked by Fellows automatic pinion sizers. They were delivered to a conveyor for transfer to a Lamb storage unit, from there to a Fellows shaver.

Michigan Tool exhibited a similar line for automotive pinions in which the work was fed to the gear cutter from a vibratory hopper, and after machining, automatically delivered to a classifier for checking sizes. Here, parts within limits are separated from undersize and oversize gears, which are also sorted. A controller automatically adjusts center distance between the cutter and the work and, in addition, keeps a record of production and shuts the machine down after a predetermined quantity is reached.

AUTOMATIC HOBBING

Barber-Colman showed an automatic hobber redesigned and improved. For example, a combination shuttle-type feed and magazine was demonstrated. This device is cam operated through a linkage. Magazine and shuttle bracket remain stationary while the shuttle is driven in and out. The shuttle picks up the blank and presents it to the center for clamping. Magazines can be designed for either unit loading or arbor loading several pieces at one time. Automatic feeding, holding, clamping and driving devices are all standard, although special provisions can be made for hand operation when desired. A new Barber-Colman vertical hobber is also automatic and includes automatic loading, (from vibratory hoppers) automatic gaging, hob shifting and other features.

Another high-production, long-run hobber is the Fellows Heliguide machine. Designed for plunge cut and climb hobbing, the machine cuts external spur and helical gears up to 12-in. OD. Cutting starts at the bottom of the work with the work-slide moving down past the hob. Two work spindles and two hob heads mounted directly behind them are independently controlled and can be operated as separate gear-cutting units.

Gould & Eberhardt hobbers with automatic cycling were also demonstrated. These universal machines cut spur, single and double helical gears, spline shafts and sprockets. Working on a vertical cutting principle, the machines have fast in-feed followed by either climb or conventional cutting at hobbing feed. A self-resetting hobber shown by Lees-Bradner includes self-loading and unloading and adjusts itself for PD control and signals for hob shift.

AUTOMATIC GEAR GRINDING

Geargrind, Detroit, showed a fully automatic gear grinder. The machine can be hopper or magazine fed and has an automatic work release at the end of its cycle. Automatic multiple diamond trimmers cut wheel-dressing time, and multiple wheels increase gear-grinding production. Rejection of defective work is automatic, and automatic downfeed control permits an operator to preset total stock removal and the amount removed per stroke.

RADIAL FEED IN SHAVING

An internal gear shaver exhibited by National Broach employs a radial feed of cutter to work. By eliminating conventional traversing feed as the cutter rotates, faster operation is obtained, because the table only travels vertically instead of both vertically and horizontally. This automatic differential up-feed permits selection of a number of cutting strokes with or without a selected number of idling strokes. Up-feed of any selected amount can be used for each individual cutting stroke under complete automatic control.

Drilling

Infinitely adjustable speeds, hydraulic feeds, self-powered unit drillheads, and special effort to minimize the non-cutting time on radials seemed to cover the most popular aims in new drilling equipment.

Some of the new radial drills showed outstanding improvements such as redesign for greater rigidity, sizable increases in power, more capacity in the same machine size, double right-angle bases to permit one job to be set up while another one is in work, and preselection of feeds and speeds.

American Tool Works now provide a larger-diameter column and opposed Timken preloaded bearings to support the arm. In place of the split cuff frequently used to clamp the column, there now is a solid cuff that contains radial-plunger clamping, controlled by pushbutton. This machine was demonstrated drilling a 3-in. dia hole in steel at 109 rpm and 0.033 ipr feed—and pulling 25 hp from a 20-hp motor.

Typical of controls, simply twisting a knob on the panel of this machine causes all of this: unclamps arm girdle, squirts shot of oil into girdle, squirts shot of oil into elevating nut, shifts elevating clutch, and causes arm to raise.

Barnes Drill has incorporated a hydraulic feed unit with a base to provide an automatic-cycle drillpress having two feed rates plus automatic approach at the touch of a button. With 1500-lb thrust, the drill is rated for 3/4-in.-thick steel; has feed rates from 1 to 22 ipm.

Fosdick showed a sensitive radial which provides a base and a table, either of which may be set up with work. Also, both the table and the arm rotates in a full horizontal circle. And an outboard support is available, to make this a most versatile and accurate machine, especially for the job shop.

One automatic drilling machine (Natco) has a mechanical feed unit, utilizing a feedscrew, but operated by dial control through an electronic system for fast, widely adjustable, and positive feed selection.

A further example of versatility, or flexibility, is Kaukauna's "universal" radial which permits 36-in. arm travel and 102-in. maximum radial reach. Vertical headstock travel is 60 in., and the column can travel along the base 48 in. Head swivels 360° and trunnion swivels 180°. With a 10- to 20-hp motor and rapid traverse at 80 ipm, this machine will do some otherwise very-difficult-to-reach tasks. Each motion is separately motorized.

Among simpler but tricky devices was an automatic driller (Fairchild Aircraft) for small holes. Guided by a saw-tooth templet of sheet steel, this machine produces three 3/32-in.-dia holes per second in 0.064-in.-thick 75S-T aluminum. Another useful tool is a portable drillpress (Bux) with a magnetic base which will grip any flat ferrous surface with a force of 800 to 1200 lb.

Threading and Tapping

Three things were particularly noteworthy among various displays of threading equipment: continuous automatic threading operations, thread broaching, and the apparently sizable trend toward leadscrew tapping.

US Tool Co eliminates a secondary tapping operation by adding a high-speed tapping unit to its multi-slide machine. Unit is keyed in with the cycle so that stamped parts are tapped immediately after forming. Cleveland Tapping Machine finds that elevating the table, with a lever or air, is simpler, more positive, and less fatiguing than raising and lowering the head on its multi-spindle tapper.

Jones & Lamson showed a new single-point threading attachment for turret lathes that operates at high speed; was turning complete threads in seconds. It has precise lead control, will chase close to shoulders, and chase taper and straight threads on the same work. Automatic cycle includes: positioning tool, chasing thread, withdraw tool, return carriage for next pass. stop at end of cycle (8 passes).

Reed Rolled Thread, Landis Machine, and Sheffield displayed new thread rolling equipment. Reed and Sheffield have attachments for roll threading on screw machines and turret lathes in which gearing is enclosed; timing and roll adjustment can be handled with the unit on the machine. Landis Machine showed a redesigned Pee-Wee thread roller that will thread from 3/16 to 3-in. dia. Rolling pressure is adjustable to 18 tons. New Reed machines include a 2-die, manual or automatic and a smaller dia than heretofore, and a 3-die as well as a 3-die spline roller turning out 2-in.-long coupling splines in 3 sec. each.

THREAD GRINDERS

Ex-Cell-O had automatic internal and external thread grinders—complete with automatic loading, chucking, grinding and ejection. The internal precision thread grinder was set up to grind the internal ball-race thread in hardened steering-gear nuts. In an automatic cycle, parts are taken from a hopper, loaded and positioned in a chuck, finish ground, then ejected onto an endless belt. Straight or radius-form threads can be dressed on a wheel automatically as part of the machine cycle. Feed to a finish size, work-size compensation plus backlash compensation, coolant flow and lubrication are all automatic.

COLD-FORMING SPLINES

Michigan Tool's "Roto-Flo" spline roller showed "chipless machining" in forming toothed and grooved parts such as serrations, tapered, straight and helical splines, oil grooves and other forms. Basic components of the machine consist of two rack-type forming tools, two slides and a "C"-shaped machine frame. Each slide, one over the other, provides a mounting for one forming rack. The correct timed relationship between the forming racks is maintained through a connecting gear rolling in contact with timing racks that are integral with the forming racks.

Each rack is powered by separate hydraulic cylinders for both power and return strokes and the parts, usually supported between centers, are rotated by the linear movement of the forming racks. Automatic loading and unloading devices have been developed.

Boring

An outstanding improvement in precision boring machines is repeatability. One change by which this has been achieved is the return to cam feeding of the table. While cams do not permit the flexibility and simplicity of tooling obtained with hydraulic feed systems, they are positive, fast-acting, and simple. So many manufacturers have requested cam-fed machines that a number of builders now include them. However, new cam-fed machines at the Show have a number of design improvements.

To increase accuracy, Heald machines have gibs, under hydraulic pressure automatically to take up wear. For faster cycling, air pressure advances the table to the cam, at which point the cam takes over to control actual boring. While cam-operated machines are normally intended for fairly high production of a single part, the new machines permit somewhat easier setup. Cam units are designed and placed to permit ease of accessibility for changing and inspection.

VERTICAL SPINDLES

Ex-Cell-O and Heald are now providing single- and multi-spindle vertical boring machines — because customers asked for them. Actually, these machines do nothing that can't be done on a horizontal machine except simplify the handling and loading of pie-shaped or flat parts. They lend themselves to automatic loading and unloading, are more readily fitted into certain production lines, and require somewhat less floor space. On one model, a cam unit actuates the horizontal slide through mechanical linkage. Cam action moves the slide in, and air pressure rapid-traverses the slide out at the end of the cycle.

Of unusual design was a precision boring machine (Pope) having its bridge and table set at 45° to simplify loading and unloading as well as chip and coolant removal. This machine also contained an unusual drive mechanism, an adjustable-speed dc motor deriving its current from a full-wave electronic unit which regulates speed, dynamic braking, and rapid reversing. Motor drives two speed reducers designated "feed" and "traverse" and thence, by selective use of two dc electric clutches, to a third speed reducer which incorporates the table-drive drum.

This cylindrical drum is connected by a mechanically tensioned precision roller chain to each end of the table, thus converting rotary motion of the drum to move the table to and from the work under preselected electrical control. No sprockets, cams, gears, or direct linkages are used so vibration is minimized.

High-speed boring came into its own in the form of a new machine (Le Blond) designed specifically to permit the use of gundrills and trepanning tools which will produce, for example, a true-round and straight hole, 1-1/8 in. dia and 8-in. deep in 303 stainless steel at 7 ipm. While this machine is considerably advanced over conventional gun-drilling equipment, we should like to have seen a design that would permit turning either the drill or the work. In this machine, the drill is stationary and the work is rotated, conventional practice, hence the machine is largely limited to symmetrical and balanced workpieces.

Improvements to horizontal boring, drilling and milling machines are largely directed toward heavier cuts, more flexible operation, and, especially, minimizing non-cutting time. Details such as hardened spindles, hardened bedways, nonmetallic table and head ways, increased horsepower, greater use of anti-friction bearings, and huskier construction for rigidity are common to most of the new machines. Of particular note is the increased number of controls placed within the pendant. This, in turn, requires much broader use of servo systems and electrical relays. Automatic table positioning, described under *Numerical Control*, is available for some machines on special order.

JIG BORING

A number of new jig borers made their appearance, with table positioning a primary consideration in all. Some include automatic positioning, others make it available at extra cost. Kearney & Trecker has developed a new manual-positioning system that utilizes a double screw, one for moving the table and a second, precision ground and hardened, to indicate location to 0.0001 in. Here's how it works:

The handwheel turns an unhardened screw which drives a nut attached to the machine table. Parallel with this screw is a hardened and ground precision leadscrew which is engaged in a free-floating nut, spring loaded to ride against only one flank of the screw to eliminate backlash, which rides with the table. A 0.0001-in.-increment dial indicator in the side of the table shows the relationship between leadscrew and table. The opposite end of the leadscrew is attached to a drum calibrated in 0.01-in. increments and having a vernier for reading to 0.001 in. A small knob controls minute positioning of the floating nut to zero the indicator. Thus the handwheel is turned until the drum indicates the nearest thousandth of an inch, then the knob is turned to bring the indicator to zero, and the table is positioned to the nearest 0.0001 in. Because there is no load on the measuring screw, errors from distortion are avoided and wear is minimized.

Most new jig-borer designs include improved structures and broader table supports. One Pratt & Whitney machine provides two 1½-hp adjustable-speed motors to power table and cross slide independently operated from a single panel and capable of positioning within 0.0001 in. or better.

Duplicating and Tracing

Lathes with tracing attachments included a Warner & Swasey No 2A turrent lathe with the unit mounted at 45° on the rear of the cross-slide for operation with the spindle operating in reverse.

A Lodge & Shipley "Copymatic" was equipped for contour facing, turning, and boring through a 45° tracing slide and a 90° cross-slide as well. On this machine, individual tracing heads can follow either the facing or turning templet. Lodge & Shipley also demonstrated a 60-in. "T" lathe with a hydraulic tracer for contour-facing large-dia work. Infinitely adjustable drive provided constant surface speed across wide faces.

For machining shafts in small or medium lots, Seneca Falls demonstrated a fully automatic cycle lathe with a front templet holder. After

starting the cycle by pushbutton, rough and finish cuts are taken, the carriage returns to start position, and the spindle is shut off.

ROLL CONTOURING AND HEAVY-DUTY WORK

LeBlond exhibited a roll-contouring lathe of 50-in. capacity with a two-direction tracer that handles steep-angle contours. A single valve controls two hydraulic motors automatically. In this machine a flat templet is mounted behind the work. The cross-slide can be retraced under templet control hydraulically, but mechanical rapid motions are built in for the carriage and slide.

For heavy-duty operation, Jones & Lamson demonstrated an automatic tracing lathe. This sequentially controlled machine removed up to 1/2 in. of material on one, two, three, and four automatically controlled tracing cuts. A two-position automatic indexing toolholder on the tracing slide allows roughing with one tool, finishing with the other. Clamping and tailstock setting are automatic and feed and speed changes can be made automatically during a cut to insure proper surface speed on changing dias and angles.

Another J & L lathe has two-way hydraulic tracing for inside and outside contours of chucked work. The machine employs a flat 1 to 1 templet and two-way tracing from a cross-slide hex turret is achieved by the coordinated movements of cross and longitudinal slides. Profiling toward the spindle and at 90° from it is done with the same templet and chucking. Ex-Cell-O showed 2-way tracing on a 2-head boring machine finishing contours on an aluminum jigger—outside on the way in, inside on the way out.

AUTOMATIC CONTOURING

A Monarch "Hydra-Slide" automatic cycling lathe was an Air Gage Tracer on the hydraulically operated front slide. With this setup, straight or contour turning, facing, or boring is done automatically. A hydraulically operated rear slide unit handles necking and grooving.

The tracer slide can be set at a 30°, 45° or 60° angle and changing over from one to another is simply accomplished by employing tapped holes in the front feed slide arranged for all three settings.

Automatic tracer-controlled movement of a Giddings & Lewis vertical boring and turning mill was exhibited also. The system on this machine included a tracer head with a stylus and motors providing individual drives for each motion. The control is equipped with relays that stop the machine if the tracing head deflection becomes too great or too small.

Tracer control was much in evidence on Gorton pantographs and duplicators as well as on American "cross-center" hydraulic duplicating lathes used for contour boring, facing and turning with flat templets. A new attachment shown for any lathe was a self-contained hydraulic tracer recently developed by Leland-Gifford. This device has a micrometer adjustment for size control through the stylus, and the toolholder employs an eccentric clamp to permit fast tool changes without losing size. The toolblock has two V-shaped faces, one for holding conventional tools and the other for reversed boring tools—used for contour facing with a flat templet.

Gaging and Inspection

Air and electronics, independently and combined, are being used for some highly ingenious systems. Some techniques are purely gaging while others feed responses to machines to provide automatic control. Many of the new systems show a design trend aimed at making it possible to incorporate the gages with machine control systems. Never before has the importance of sound gaging principles been so apparent as on automatic operations. When parts are hopper-fed, for example, pregaging is essential because the operator is no longer there to check pieces as they are placed in the machine. Process control has created a whole series of new problems.

Sheffield showed a new contact air gage for forecasting radial play. It measures inner and outer bearing-race rings, then determines the difference to show the proper ball size for a predetermined amount of radial play. Device checks functional radial play while rotating the part; is accurate to 50-millionths in. Among many other new devices, Sheffield also showed a Sequential Quality Control recorder system that monitors a process, giving a plot of quality control average or trend plus a separate range of sequence. Method can be tied in to machine-tool controls for direct process control.

Among Taft-Pierce's new air gages is a "computer" for gaging taper, alignment, and concentricity of two diameters; squareness of bore to face, center distance without regard to hole size, etc. Gage works on differential of two venturi units feeding to opposite sides of a diaphragm. Also, T-P has an air gage for holes as small as 0.048-in. dia and a wide-tolerance gage to measure ranges up to 0.125 in. (without mechanical linkage). Using sensitive diaphragms to convert air flow to electrical impulses provides a means of using indicator lights and actuating mechanisms with air gaging.

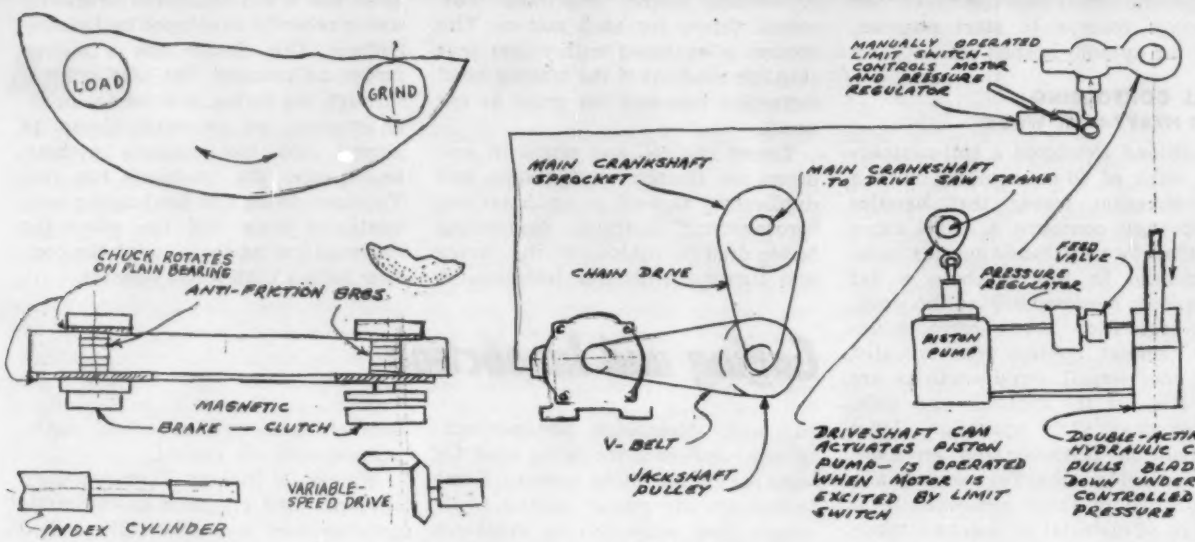
Warner & Swasey Research Corp demonstrated a system of automatic programmed inspection. It's called Probograph. An electric probe is used to take dimensional readings of the part. These readings are electronically transmitted to a recorder where measurements are graphed. All of the dimensions on a part can be gaged simultaneously. This device will plot trends as well as indicate out-of-tolerance parts. It can be tied in, too, with process controls.

Airborne Instruments Laboratory has developed a number of automatic electronic inspection systems, largely for high-production items. (*AM*—June 6, '55, p121). These devices include an electronic size-control system for grinders, automatic piston inspector, connecting-rod inspector, and a final-inspection gage for steering-sector-roller teeth.

Simple but positive gaging units have been developed by Boice Manufacturing utilizing dial indicators. Gages include snap, bore, and length units plus special adaptations. Benefit is that many gages can be constructed by combining off-the-shelf units. New adjustable setting masters simplify the old resetting and checking problem as well as lower the cost of gage tooling.

Micrometrical Mfg showed an automatic profilometer that sorts parts according to surface roughness. Normal work speed is 0.3 in. per sec. Tracer is automatically short-circuited when it contacts the work and when it leaves the work, so "kicks" do not affect sorting.

Addition of a photographic polarizing lens to the Kodak contour projector turns it into a polariscope to show strain patterns in plastic models of parts. Another unit with red and green binocular system compares parts to a good sample.



Two Interesting Drive Arrangements

Loading time is cut on Thompson twin-rotary surface grinder (left) by this indexing table. One chuck is under the wheel while the other is loaded. Rapid traverse of wheelhead to work is automatically slowed to feed through a Kirkman motor torque control. Instantaneous response of wheelhead motor to current increase when wheel touches work cuts feed-speed. Racine Saw (right) uses limit-switch arrangement to eliminate friction clutch, gears, pinions, clutch cone, etc. When thrown, switch excites motor to drive crankshaft, simultaneously actuates pressure regulator. Cam on crankshaft operates piston pump for oil delivery to cylinder that controls blade

Motors & Drives

Horsepower ratings on motors for DoAll bandsaws have been increased 400% to meet higher speed and feed ranges made possible with the HSS blade. . . . Infinitely adjustable-speed motors have been placed on surface grinders to maintain correct peripheral wheel speed as the wheel wears. Motor drive also permits longer life from grinding wheels.

Cincinnati centerless grinders now have infinitely adjustable speeds to the regulating wheel through a double sheave. Drive provides a speed range from 22 to 300 rpm. Double-sheave arrangement provides braking action against driving force of the grinding wheel to upset the preset regulating-wheel speed when work is engaged. . . . Gray has an amplidyne adjustable-speed motor on an open-side planer, giving table speeds from 30 to 400 fpm, controlled from a console.

Pneumatic drive on truing devices has been replaced with an independent hydraulic motor driving a leadscrew. New control offers more accurate traverse feed of diamond.

Horsepower ratings in general are up 25 to 100%. For instance, Jones & Lamson increased spindle-motor size from 20 to 40 hp on the 12-in. bar machine, DoAll went from ¾ to 3 hp on the cutoff saw, and from 3 to 7½ hp on larger bandsaw models; Cone increased horsepower 20% to use carbide tooling, and Cincinnati increased motor horsepower on all models anywhere from 50 to 100%.

Notes on Speeds, Feeds, Controls

Several cylindrical and centerless grinding machines have electro-mechanical controls for automatic compensation for wheel wear as a result of redressing. The electrical device is also an integral part of the feed-screw on the truing instrument. As the screw advances during redressing, a signal is sent to the dc motor to maintain correct peripheral speed. New horsepower rating dial shows when stock removal is excessive and the occurrence of wheel loading.

An automatic threading control on the J & L standard turret lathe has a hydraulic unit which powers automatic tool infeed to proper graduation cutting depth for each pass. It also powers the engagement of split nut to leadscrew, tool relief after each pass, and carriage return after each pass.

A five-pitch leadscrew, with a 4-speed selective gearbox, provides all required thread pitches. Positive depth control for each successive pass is accomplished by a stop spool with eight pins of different heights. After the tool is withdrawn at the end of each pass, the spool is automatically indexed to the next depth. After the eighth pass, the stop spool contacts a valve which terminates the entire threading process. A second hydraulic cylinder, connected directly to the main cylinder on a leadscrew, is mounted at the rear of the cross-slide for tool feeding and withdrawal.

An ampere gage on the new line of Micromatic vertical hones shows when a resharpening of stones is needed. When excessive current is drawn across the field of the motor, a signal feedback system automatically stops rotation of the spindle drive. A separate motor, which powers rise and fall of the honing head, continues to "through stroke" the stones just slightly more than half their length beyond the edges of the work. The stroking action redresses the stones after several passes, when the signal feed-back "kicks-in" the spindle drive motor for normal operation.

One manufacturer of grinders is presently working on a project to eliminate mechanical and electrical wheel positioning controls. He intends to substitute an electric eye beamed across flanges on work to position the wheel.

Spindle feeds on the Cincinnati radial drill were increased to a 40 to 1 range and include feeds for standard leads in all NPT series.

Pendant control regulates eight spindle speeds provided from an independent motor to the drive spindle of Cincinnati universal millers. Additional separate motors drive the horizontal spindle and table. Independent arrangement of motors for each of the drives provides full horsepower rating at the source. Three limit switches inside pendant control activate a magnetic clutch inside the gearbox for changes in spindle speeds. Pushbutton dial type speed indicator is provided for the horizontal spindle. A similar speed indicator is provided for table feed.

There has been a noticeable increase in the speed and feed ranges made possible by the 100% jump in hp rating on milling machines, die-sinking machines and profiling machines, mainly brought about by the increased demand for higher production on lighter metals, high-speed machining with carbides, and elimination of machine stalling on heavy cuts.

Infinitely adjustable feed speeds up to 150 rpm have been provided on bed-type milling machines, plus a backlash mechanism for better control and higher production in climb milling.

Ball-bearing ways have been added to Cincinnati centerless grinders for accurate feed increments during inching and size control of work, eliminating common problems of friction and sticking of gib ways.

Speeds and feeds increased as high as 50% on #7 Fellows gear shapers, jumped the production rate of a planet pinion job 75%. Pinion of 5135 steel was cut at 80 sfpm (14 pitch, 22° helix, 1¼ dia and face) with negative rake on cutter in a cycle time of 1 min. per piece.

Adjustable hydraulic feed rates up to 0.20 in. are provided on Landis multi-wheel cylindrical grinders, and a 40-hp adjustable-speed motor to the wheel spindle is controlled for constant peripheral speed. Rheostat on wheel slide compensates speed during wheel wear from 42 to 28 in. dia. A speed-indicator dial permits operator to check spindle rpm. Hydraulic feed advances wheel at rapid rate to point of grinding feed, which is then controlled by movement of steel rollers operating between two steel guide plates. One guide plate is adjustable from a graduated knob on the wheelhead, which controls amount of slow feed and resets itself at end of each grinding cycle. Feed rate is controlled from the machine front.

Servos . . . A production Microflat machine uses a servo-mechanical device automatically to control size of parts while two opposed surfaces are honed parallel and flat. As the parts leave the abrasive, at an average production rate of 1500 parts per hr, they pass through an air gage that indicates thickness on a dial. Feedback system controlled by air gage adjusts spacing between abrasive disks to compensate on a wedge drive for rise and fall of upper abrasive disk.

Spindles . . . To take in stride the demand for higher speeds and feeds and the increased horsepower, spindles are being built heavier and more accurately (concentricity to 0.0002 in.) Latest designs incorporate a combination of thrust and radial type ball bearings stacked in tandem.

Controls . . . Automation switch for power presses (Bliss) is mechanical, but electrically controls stops, starts, interlocks, motion, time, and recycles of auxiliary equipment. There are nine control switches in the unit, and each can be independently adjusted from 0 to 360° by a knob dial and stem which reads like a micrometer. It's accurate within less than 1° and each switch can be operated open or closed.

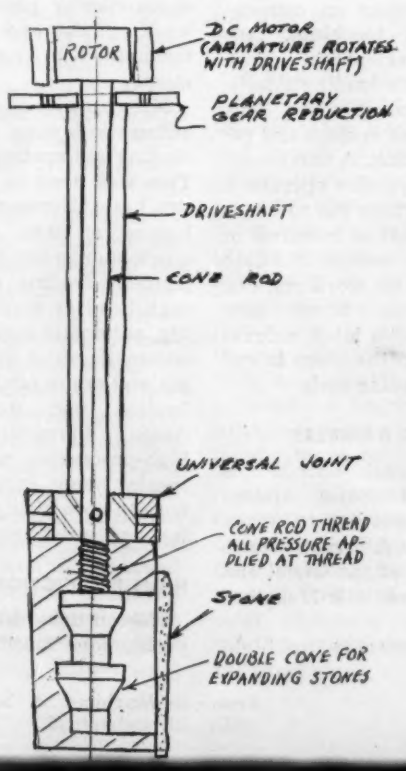
Many machines incorporate a control gage which shows the percent of hp rating consumed on a given setup. The control was added to indicate to the operator any trouble areas which might develop after the original setup and to point up a need for resharpening whenever necessary. Danger areas result in increased torque to the motor and consequent increase of hp on the gage.

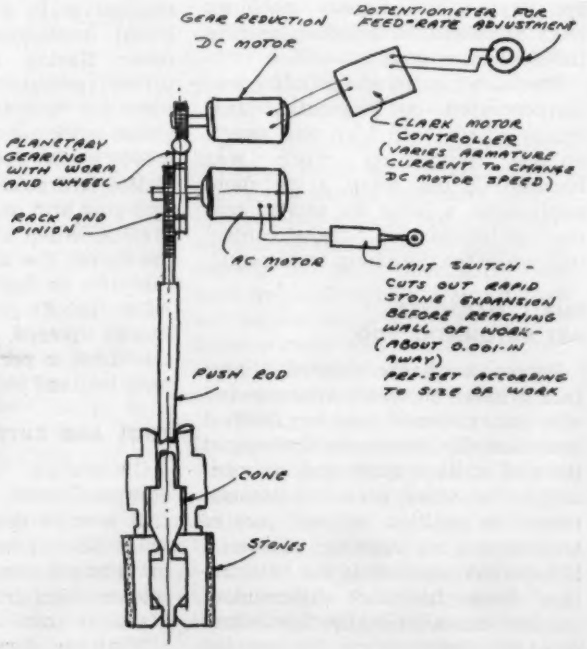
Pneumatic controls have been added to feed bar stock on multi-spindle bar machines. Limit switches and solenoid valves activate a clutch and brake for positive feeding.

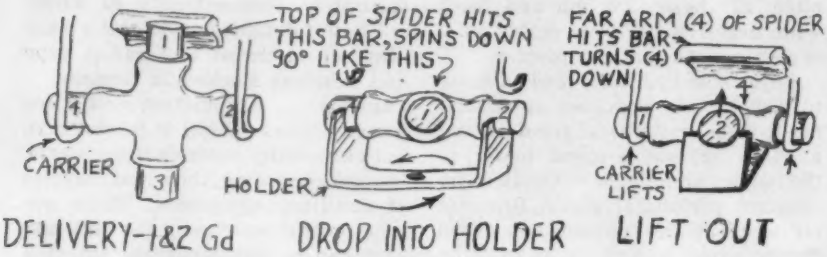
Pick-feed control, shown by Cincinnati, has been incorporated on plain hydraulic grinders. The control provides automatic pick-feed, adjustable from 0.0001 to 0.0025 in. on the radius. The setup man can pick up at the positive stop on the left, right, or both ends.

Simple Hone Compensation

The new "Roto-Feed" (Micromatic, left) for heavy stock removal (0.008-0.020 in.) feeds stones continuously until worn out Torque control of the dc motor provides high-speed rotation of the cone rod until stones engage work. Resistance then increases current demand at motor and changes speed to feed the stones. The Barnes Drill method (right) uses electronics and two motors to control feed rate and compensate for wear. The ac motor brings stones to within 0.001 in. of the work, then cuts out. The dc motor handles feed and avoids impact. Feed rate is set by potentiometer




GEAR REDUCTION
DC MOTOR
POTENTIOMETER FOR FEED-RATE ADJUSTMENT
CLARK MOTOR CONTROLLER (VARIES ARMATURE CURRENT TO CHANGE DC MOTOR SPEED)
PLANETARY GEARING WITH WORM AND WHEEL
RACK AND PINION
AC MOTOR
LIMIT SWITCH - CUTS OUT RAPID STONE EXPANSION BEFORE REACHING WALL OF WORK - (ABOUT 0.001-IN AWAY) PRE-SET ACCORDING TO SIZE OF WORK
PUSH ROD
CONE
STONES


TOP OF SPIDER HITS THIS BAR, SPINS DOWN 90° LIKE THIS
CARRIER
HOLDER
FAR ARM (4) OF SPIDER HITS BAR TURNS (4) DOWN
CARRIER LIFTS
DELIVERY-1&2 Gd
DROP INTO HOLDER
LIFT OUT

How to Turn a Spider

Automation is bringing in many ingenious position changers. Here's one: Bearings on spiders are ground on a 4-wheel Landis Tool grinder. Two spiders are ground at once, one on bearings 1 & 3, the other on 2 & 4. The two spiders are lifted off support blades by twin sets of hooks and brought out. A quick flip of the hooks throws off the completed spider into a chute. What happens to the other is sketched. It is turned flat as it strikes a bar, then turned 90° in the horizontal plane, relifted by the other pair of hooks, and turned back to the vertical. Meanwhile the hooks which dropped it pick a new spider from the feed chute

Grinding, Honing and Lapping

Grinding equipment clearly showed the influence of the automotive industry in automatic cycling, automatic loading, clamping, wheel dressing, and other devices. Here's an example—Landis, Bryant and Gardner lined up 3 machines, to show high-volume automated production of ball-bearing outer races. A Gardner double-spindle disk grinder started the cycle using a vibratory hopper. Second machine is a Landis centerless where the work is handled by "stack-grinding" 10 pieces, in each loading cycle. After air-gage inspection, an automatic Bryant internal grinder receives the parts for finishing. In another automated setup, Bryant and Landis machines were combined for grinding bearing inner races.

Precision turning and grinding was demonstrated on Frauenthal machines where both high and small-volume production work was handled. In one setup, a tool-room application, a large die section was contour turned with a tracer control unit while the periphery was ground.

SMALL MACHINES ARE AUTOMATIC, TOO

Brown & Sharpe showed a new face grinder on which concave and convex surfaces can be finished automatically. Automatic dressing at the end of each cycle and compensation for wear permit automatic return to position without loss of accuracy. . . . Another Brown & Sharpe development is the "Electrolign" device for quick alignment of grinder tables. Basically, this instrument provides a means of measuring small angular movements of a grinder swivel table relative to the sliding table. A strain-gage measuring head on each end of the sliding table maintains spring contact with the swivel table. Signals from measuring heads are combined and amplified to give electrical meter readings of swivel movements. Each meter division represents 0.0001 in. taper for the part length set on a selector dial. Similar to this is the Norton "Swivelign"—also used on universal grinders.

Norton's new semi-automatic Multi-Wheelslide cylindrical grinder was developed to handle multiple-dia parts with shapes that don't lend themselves to grinding on conventional multi-wheel machines. Another Norton development is a turret-type automatic loading attachment for cylindrical grinders. This places work between centers and removes it after grinding. A valve-controlled hydraulic cylinder operates a swinging arm on which the turret is carried. When a part is received in the turret, the arm swings to locate the piece in line with work centers. After grinding, the turret arm swings upward, and a latch indexes the turret to permit the piece to roll onto inclined unloading rails.

TOOL AND CUTTER GRINDERS

Cleveland's "Visual Grinds" is equipped with an optical system that permits the operator to watch what he is doing. A screen shows an enlarged image of the wheel and section being ground. J & L showed a similar unit.

Mattison demonstrated its high-powered surface grinders in addition to a 4-spindle rotary automatic with sizing gages that compensate for wheel wear. An automatic Reid surface grinder demonstrated infinitely variable dial-controlled speeds from 0 to 70 fpm and Covel showed a universal cutter and toolroom grinder with a Pope tilting head. Other cutter grinders included Cincinnati's model No. 1 with a "tange-bar" taper-setting device for the swivel table, and an Oliver cutter grinder that permits grinding any desired clearance without computations. With standard fixtures, these machines grind spiral-taper reamers, counterbores, double-angle cutters and others. Heald's Model 3 tool sharpener has direct-reading scales for setting various angles and nose radii. Also in the cutter-grinder group is the Motch & Merryweather blade sharpener that handles circular blades from 8 to 45 in. in dia. High and low teeth can be ground with a single setting, and grinding contour is automatically produced by cam action, with index plates controlling tooth spacing.

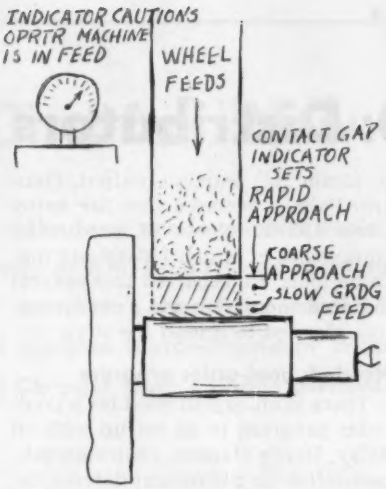
HONING AUTOMATED, TOO

Micromatic showed two setups for honing pinions (one for soft gears, the other for hard), and Barnes Drill showed one. In these exhibits, pre-operation parts storage was employed. Micromatic used a Lamb storage rack, and both setups had vibratory hopper feeders. Parts were automatically positioned under the work spindle and the honing cycle terminated by automatic measurement.

Micromatic also demonstrated automatic honing of large parts including automotive connecting rods. This was done in a combination of two basic Micromatic machines, each having a 10-in. max stroke and quick-change tools. Automatic, independent feeding was employed in each head as well as automatic sizing, automatic stone wear indicators, automatic work indexing, (for wrist pin and crank pin bores) and special loading and unloading fixtures. Among Barnesdril exhibits were high-production machines with electronic hone expansion, automatic bore-to-bore sizing, and quick loading and unloading fixtures.

HIGH PRODUCTION LAPPING

Norton demonstrated a new high-production machine designed for


INDICATOR CAUTIONS OPRTR MACHINE IS IN FEED
WHEEL FEEDS
CONTACT GAP INDICATOR SETS RAPID APPROACH
COARSE APPROACH
SLOW GRDG FEED

Rapid Wheel Approach

To increase production and reduce cycle time, a wheel-approach control was demonstrated on Landis and Cincinnati cylindrical grinders and the Arter rotary surface grinder. Sketch shows the principle

either single or parallel-face flat lapping. The machine can be arranged for a plain timed cycle, automatic continuous feed, or semi-automatic continuous feed.

Cut-off and Filing

Improved controls, clamps, feeds and automatic cycling were evident in cutoff and filing equipment. Motch & Merryweather demonstrated an automatic circular sawing machine with six spindle speeds by gear change made by a dial at the head. The machine automatically feeds round or square bars (to 8 in.) to the cutter where they are automatically clamped and the cycle started. Manual or semi-automatic cycling is possible, too.

Oliver Instrument Co showed automatic sawing and filing machines with hydraulic feeds. Designed especially for die making, the machines have tables that tilt in three directions to allow bevelling or sawing and filing any desired shape.

Racine exhibited metal-cutting machines in which hydraulic pressure carries the saw blade downward throughout the cutting stroke. Feed is applied progressively without cams, levers, or other mechanical elements. As the blade is applied only as fast as metal is removed and no heavy pressure is employed with proper feeds, the teeth cannot load and wear is evenly distributed over the entire cutting surface.

In Passing...

● Single-point threading by automatic threader on a J & L standard turret lathe cut a 6-pitch taper and straight thread 3¼ in. long in 1141 steel at 2000 fpm in 40 sec.

● Gemanium is cut into wafers (DoAll) from 0.005 to 0.050 in. thick, perpendicular to the Y axis (the only way it *can* be cut) by a grinding wheel 0.015 in. thick by 3 in. in dia. A universal spindle head establishes Y axis in any plane. Wheel speed is 7000 rpm, work speed 350 rpm, and feed 1/8 ipm.

● Bandsaws are now doing angular cuts, compound angles and slotting, formerly milling jobs. Present setups include hydraulic clamping and feeds; full-automatic sawing is imminent.

● Sheffield uses a helically multiple-ribbed wheel to produce gears up to 8-in. dia from a hardened blank (16 P and finer) to extreme accuracy, can do several gears at once (stroke 4 in.) and produce uniform tooth form concentric with the bore. Gear Grinding Machine Co has a similar unit. There is no distortion; spur or helical gears may be ground with one wheel dressing. The wheel is crush-dressed, then finished to shape by diamond automatically.

● Sheffield also has an electrical attachment that can simply be plugged into a suitably equipped machine tool to check the accuracy of its functioning quickly.

● Cogsdill showed the "Burraway" deburring and chamfering tool. It takes burrs off both inside and outside of through holes—even two in line—in one pass, doing the entering edge on the way in, the inner edge on the way out. One tool covers a range of hole sizes. It is essentially an arbor with spring-loaded cutting blade (which collapses into the arbor for clearance) having cutting edges front and rear, with an accurate, convex surface between to touch hole walls and collapse it. A collar blade will handle burrs on tube OD's.

● Keil Chemical showed at the PE Show grinding solutions which change color from red to yellow as rust-inhibiting components are consumed. Solutions are non-foaming, clear, eliminate rust even at 100:1 dilution, inhibit bacteria, and do not turn rancid.

● One auto manufacturer, Ford, is going back to single-spindle, high-speed machining of parts like steering knuckles, instead of using multiple-spindle equipment. The lathe used for this job (Hydra-feed) rough-turns the flange and turns part of the fit for the larger bearing with rear tool to get rid of most of the scale, mismatch, etc, that induces tool wear and chatter. Then an overhead slide, under control of a Turchan follower, machines part contour, including refacing the flange. Only the two bearing fits require further machining, in this case grinding on a Cincinnati setup with a new work loader. Lathe cycle is 43 sec. Machine is built "wide open" for automation, and can be supplied with pickup fingers.

● Cincinnati-Bickford showed a tricky large-hole job on a 15-ft-arm radial with 15-in. column and 15 hp. It trepanned an 8-in. hole through 3-in. steel without a pilot hole, bored to 8 3/8 in. without pilot, then put through an 8-in. pipe tap, all at 10 rpm, with 0.050-ipr feed on the first two operations, 0.125-ipr (8 tpi) on the last.

● There were at least 20 models (some working) of machine tools, presses, and production lines too big to be shown. We photographed them, but are without the space to publish 'em.

● Oldest machine at the show was a 100-year-old G & E shaper, second oldest a Natco turret-head drill 51 years old. The latter is still in use on side frames at National Cash.

● While Show regulations severely limited booth decoration, required blue shopcoats for operators, and set machine-tool gray as the color, there were several distinctive touches in attendants. Most successful (and most helpful) were the cream coats and brown slacks worn by Jones & Lamson men, who could be spotted amidst visitors easily—except when the temperature hit 95 F in the shade on Friday, and all coats came off. Landis Tool men wore maroon ties with white lettering, Gisholt men wore red ribbons under their badges, Fellows men had tie clips and cufflinks with a changeable gear design —and so on. Certainly something must be done to identify men from the "home team"—visitors asked us questions in almost every both, because we had red exhibitors' badges.

AMTDA MEETS IN CHICAGO: Distributors

U S machine tool distributors squeezed their usual two-day annual meeting into one day's sessions preceding the opening of the Machine Tool Show. It was a day packed with VIP's as speakers, and with preparations for the greatest selling era in machine tool history

CHICAGO—As a prelude to the Machine Tool Show, the American Machine Tool Distributors' Association departed from its normal procedure of having two-day sessions and held its 31st annual meeting on September 5, crowding its entire program into the one day preceding the opening of the show. The occasion was "a good deal like the night of a dress rehearsal," as M A Hollengreen, president National Machine Tool Builders' Association and president Landis Tool Co, put it in addressing the meeting. A luncheon at the Conrad Hilton Hotel with several hundred machine tool builders as guests of the distributors was a gala feature of the program. William Newberg, vice president of Chrysler Corp and president Dodge Division, spoke on "The New Era in Machine Technology" at the luncheon. His remarks are reported on the opposite page.

Major market: replacement

Replacement is the big market for machine tools today, Mr Hollengreen said. The need for it in metalworking plants is obvious and recognized. The main problem is where to begin. The sensible thing for a company to do is to make a survey of its machines and decide what is most in need of replacement, and what is next in importance, and so on. Thus a practical replacement schedule can be established and taken to the financial man in the front office to decide how much of it can be handled as the first bite.

Mr Hollengreen pointed out that companies using machine tools are experiencing a double increase in cost as an aftermath of wage advances and increased prices of materials. They probably can pass along only a fraction of this added cost to the general public. Hence, to protect their profits, they must reduce costs. "The way to do it," Mr Hollengreen stressed, "is to throw out the old high-cost machines and put in new ones that will turn out more work per manhour." In fact, the question is: How long can a company afford to keep operating its old machines?

Buyers are not thinking of new machine tools in terms of gadgets and devices, he declared. They are interested in reducing the cost per piece produced. Unless machine improvements can be translated into dollars saved, no sale is likely to be made.

Distributors were urged to make full use of the fact that a buyer today, thanks to new depreciation provisions in the tax law, can recover the entire cost of his machine a lot faster than formerly. In purchasing a new machine now, Mr Hollengreen asserted, "a company is not taking a capital investment risk that looks into the indefinite future."

The machine tool industry must do a first-class selling job after the show, William C Rutz, chairman NMTBA show committee and executive vice president Giddings and Lewis Machine Tool Co, told association members. The big job is to induce the buyer to take the first step toward replacement. Mr Rutz was one of three participants in a panel on the show. The others were Frank Habicht, chairman AMTDA show committee and vice president and general manager Marshall and Huschart Machinery Co; and Saul Poliak, Clapp and Poliak, show managers.

Packaged production lines being "mothballed" by the Army will be sufficient in an emergency only to take the first shock of mobilization, General Williston B Palmer, vice chief of staff, US Army, said. This will give the machine tool industry a little more time to get into full production of the machines needed to attain full wartime output. General Palmer declared that the Army owns 450,000 pieces of production equipment, of which 150,000 are machine tools. He reported that several hundred men from the armed services planned to attend the show.

Needed: pool-order program

There is an urgent need for a pool-order program to be set up without delay, Henry Hanson, chairman subcommittee on permanent defense capacity and vice president William K Stamets Co, stated. Mr Hanson is the new president of the association. He expressed the opinion that the Defense Department has been doing a good job of disposing of surplus machine tools. He revealed that the department has been developing test patterns for every type of machine tool owned and stored by the armed services.

Joseph Owens Jr, chairman subcommittee on taxation and general manager J F Owens Machinery Co, reported on the ruling issued recently by the Internal Revenue Service to be used as a guide for determining whether agreements for payment and use of machine tools and other industrial equipment are leases or sale contracts. A news story on this ruling is on p190.

R A Vidinghoff, retiring AMTDA president and president Machinery Associates Inc, presided at all three sessions. The morning and afternoon meetings were held at the Sheraton-Blackstone Hotel.

AMTDA'S NEW PRESIDENT
Henry Hanson
Vice President
William K Stamets Co

Gird for "New Era in Machine Tools"

. . . the "new era in machine tools" is the prediction made at AMTDA's Annual Meeting by a man who ought to know. He's one of the nation's biggest buyers of machine tools—President William C Newberg of Chrysler Corp's Dodge Division. This is what he thinks . . .

CHICAGO—Machine tool technological advances in the last few years have been so great that most of the machines shown at the 1947 Machine Tool Show have been rendered obsolete by machines such as those shown at the 1955 Machine Tool Show. And it's highly possible that machine tools on builders' drawing boards are already obsoleting some at the '55 show. This accelerated and spectacular progress in technology opens a whole new era in machine tools in the opinion of William C Newberg, vice president of Chrysler Corp and president of its Dodge Division.

Speaking before some 600 machine tool builders and distributors at a luncheon during the Annual Meeting of the American Machine Tool Distributors' Association on September 5, Mr Newberg predicted that machine tool design within the next 10 years will undergo such startling changes as to make present methods obsolete.

Machine tool builders and distributors, he said, work in an "environment of obsolescence," where it is essential to build and design products so good this year that manufacturers can't afford to go on using last year's product.

Tremendous improvements in all types of metalworking machinery are forcing the pace of obsolescence, Mr Newberg said. He cited some of them: lathes that turn 15 times as fast as those of pre-World War II days; high-speed cutting metals such as tungsten carbide that vastly increase cut depths and lathe speeds; huge presses that can turn out big stampings at a rate of 18 a minute, compared with 6 a minute in 1949; machine tools that work metal to tolerances formerly considered impossible to achieve; stamping machines with progressive dies that turn out 600 pieces a minute—may produce 1000 pieces a minute in the next 10 years; and cutting by ultrasonic vibration.

TOP SPEAKERS AT AMTDA'S MEETING included, left to right: AMTDA Retiring President Raymond A Vidinghoff, president Machinery Associates, Wynnewood, Pa; William C Newberg, president Dodge Division, Chrysler Corp; and General Williston B Palmer, Vice Chief of Staff; United States Army

1st VICE PRESIDENT
J F Owens, Jr
General Manager
J F Owens Machinery Co

2nd VICE PRESIDENT
Frank Habicht
Vice President and General Manager
Marshall & Huschart Machinery Co

"Into a New Phase"

The most highly publicized of all recent machine tool developments is the use of automation, Mr Newberg said, and this is but one manifestation of a much wider, more fundamental phenomenon of our time—the accelerating speed of change in machine technology.

"We are bringing into a new phase the evolution of machine technology toward the increased use of power. Machinery today supplies approximately 96% of the energy used in manufacturing, as compared with 26% a hundred years ago," Mr Newberg said. Automation thus calls for more men who understand complex mechanics and electronics, and more millwrights, electricians and repairmen who will have more interesting jobs and get higher pay for them, he said, adding that automation also means the products of our plants will be more uniform and quality will be raised. Eventually, Mr Newberg said, automation will mean a lowering of prices and broadening of

NEWBERG (continued)

markets for metalworking products.

We are lucky, he added, that automation comes at a time when a relatively low number of people is being added to the U S workforce—in the next 20 years the population will increase 20% but the number of people between 20 and 65 will increase only 6%.

The Trend: "Steadily Upward"

Manufacturing today provides 29 out of every 100 jobs in the U S, according to Mr Newberg, contrasted to 12 out of every 100 jobs a hundred years ago. Thus the trend has been steadily upward, and it isn't likely to change in the years ahead because "as you make machines more efficient, you increase markets and also increase the activity in the factory and in the industries that supply the factory with materials, parts, power and services."

The major technical problem that faces the manufacturer today is "to design his product in such a way as to take advantage of the many advances being made in the design of machine tools. Frequently the production engineer finds it impossible to take advantage of a new machining process because of the shape of the part to be manufactured. The designer who is familiar with the latest machine methods and who designs his product with those methods in mind can save his company many thousands and even millions of dollars," Mr Newberg said.

Not only the product engineer, but the whole production staff of every company must know the capabilities of modern machine tools to make sure of optimum results in terms of capital investment. You can overspend as well as underspend for capital goods, he warned.

Needed: Federal Sanction

The federal government, Mr Newberg concluded, must encourage industry to take full advantage of new developments in machine tools and equipment. Last year's tax legislation went a long way in this direction, but even today legislators aren't geared to thinking in terms of unprecedented obsolescence. Tax experts, however, are preparing for a full-dress Congressional review of tax policies next winter, and it is to be hoped that this will result in further liberalizing the government's attitude toward depreciation.

SAE Traction Men Talk Machine-Tool Replacement at Milwaukee Forum

MILWAUKEE—Management aspects of production — such as replacement of obsolete machine tools — dominated discussions at the Society of Automotive Engineers' Traction Production Forum here September 12.

Wanted: a Replacement Formula

It was generally agreed that a machine tool replacement program based on write-off periods is no longer adequate. Both large and small companies are searching for a satisfactory formula. And while the MAPI formula has good acceptance, most of the traction men present felt that it is not the final answer.

Replace Fastest First?

One, C I Burdick of Minneapolis Moline, said the best procedure is to compute the time that a capital goods investment will take to pay off, then replace the fastest payoffs first.

Here is the gist of the day-long forum discussions:

- Firms in the tractor field are concentrating on manufacturing research in their search for ways to cut costs. One company's program has 14 operating sections, and about 300 employees.
- In many cases, processing engineers are assigned to design projects and become part of the product design team to help coordinate design and production. And several large, multi-plant companies are assigning manufacturing engineers to operating departments to (1) improve methods in a particular operation, and (2) to keep other plants advised so they can follow suit.

Psychological Testing

- Psychological testing of supervisors and specialists is on the increase. One of the biggest problems is to keep the specialist happy when he has reached his peak, i.e, when he can't go any farther for lack of management ability. One suggested remedy: pay equal to his abilities, plus an artificial elevation of his title.
- Most companies agree it's better to advance your own men than to go outside for supervisory people. And they think it's easier to teach human relations to the technical man than to teach technology to skilled personnel handlers.
- Not enough attention is being paid to indirect costs, which with the advent of automation may run several times the amount of direct costs. Reason for the inattention: They're difficult, elusive. Best way to control indirect costs is through job evaluation, establishment of standards, and realistic budgeting (preferably based on a two-year study for maximum benefit).
- An approach to inventory control can be extremely costly. For example: (1) one firm found it couldn't ship a major item on schedule because drive screws for the nameplate were out of stock, (2) another found 50% of its inventory items added up to only 1% of the dollars tied up in inventory, and (3) in another case, 70% of the items accounted for 3% of the money. The solution: be sure of an adequate cushion for such minor expense items. Then you can concentrate attention on the major items, where inventory control can save real money.

Built-in Quality Testing

- Built-in quality control on machines is a big new trend (checking the machine at the builder's plant for production operation). There is also a current tendency to include a clause in purchase contracts specifying the level of quality control required of a machine.
- Biggest new welding development is use of consumable electrodes, especially with CO_2 shielding, which costs less than argon or helium. A dual-arc shield of argon or helium can save gas cost on heavy automatic work (except on aluminum). In one test of dual-arc shield, argon volume was cut down by CO_2 additions, then the CO_2 was shut off and satisfactory welds were produced with less argon.

Improving Gear Quality

- Most important elements in gear quality improvement are use of hot-salt quenching, induction hardening, and shot peening. There was considerable interest in the salt-spinning method (AM, May 10 '54, p132). In shot peening (works best with aluminum, magnesium, brass and titanium) adequate coverage is more important than arc height. Life tests show visual inspection for coverage is not adequate.

MACHINE TOOL LEASING:

Here Are Some New Ground Rules on Its Tax Aspects

CHICAGO—Ground rules concerning the income tax aspects of leasing machine tools and other industrial equipment have been established by the Internal Revenue Service of the Treasury Department in Revenue Ruling 55-540 and Supplementary Ruling 55-542. These rulings were published in Internal Revenue Bulletin No. 35, dated August 29, 1955.

"Whether an agreement in the form of a lease is in substance a conditional sales contract depends upon the intent of the parties as evidenced by the provisions of the agreement, read in the light of the facts and circumstances existing at the time the agreement was executed," the ruling reads. "In ascertaining such intent, no single test or any special combination of tests is absolutely determinative. No general rule, applicable in all cases, can be laid down. Each case must be decided in the light of its particular facts."

After having established this premise, the ruling states that "in the absence of compelling persuasive factors of contrary implications" a lease or rental agreement will be treated as a sale for tax purposes if one or more of the following conditions are present:

- Portions of periodic payments are made specifically applicable to an equity to be acquired by the lessee.
- Lessee is to acquire title upon payment of a stated amount of "rentals."
- Total amount to be paid by the lessee for a relatively short period of use constitutes "an inordinately large proportion of the total sum required to be paid to secure the transfer of title."
- The agreed "rental" payments materially exceed the current fair rental value.
- The equipment may be acquired under a purchase option at a price which is nominal in relation to the value of the property at the time when the option is exercised, as determined at the time of entering into the original agreement, or "which is a relatively small amount when compared with total payments required to be made."

Where the terms of a contract for lease of certain equipment, together with a separate contract for financing payment to the lessor through an insurance company, clearly indicate an intent to transfer ownership of the equipment to the lessee, the contract is to be considered a conditional sales contract. Quarterly payments made by the lessee under such a contract are therefore capital expenditures to be charged off taxwise over the estimated useful life of the equipment.

Propose Federal Flood Insurance Program

Massachusetts Senators propose government insurance up to $250,000 per piece of property

WASHINGTON — Because private insurance companies "are unable to provide sufficient (flood) coverage at rates both reasonable and adequate," two lawmakers from one of the states hardest hit by the recent New England floods, Massachusetts Senators Saltonstall and Kennedy, are proposing a $1.5-billion federal flood insurance program. While theirs is the first such proposal to be fully completed, a second is under way by Senator Lehman of New York, insuring that one or the other will come up for consideration at the January session of Congress.

The recent New England floods caused upwards of $2 billion worth of damage to homes and industries (AM Sept 12/55 p170) that weren't insured against flood because of the exorbitant premium on such coverage, reportedly available only from Lloyds of London at $450 per $1000.

The only answer to a major catastrophe such as this, the Senators contend, is for the federal government to provide flood insurance at a much more reasonable rate, preferably through the Small Business Administration.

It wouldn't be necessary for the government to provide such insurance if the private insurance companies were willing to do so "reasonably and adequately," the Senators claim, but it's evident none of them wants to take the risk. If they do, however, the Saltonstall-Kennedy proposal suggests that the government invite such private insurance firms as are interested to take a "piece" of the coverage. And the government, in turn, would re-insure any flood risks undertaken by the private insurance companies to "cover" them.

Experimental Start

Initially, coverage would be extended on a "small experimental basis" to homes, industrial plants and real property. If this works out satisfactorily, the program would be expanded.

The Saltonstall-Kennedy proposal is concerned only with flood damage and excludes that from hurricanes, earthquakes and similar widespread disasters. The Senators do, however, suggest that something similar in the way of federal insurance be provided to cover such disasters.

SBA to Administer

Senators Saltonstall and Kennedy propose that the Small Business Administration administer the program, with a maximum of $250,000 insurance on any single piece of property. They suggest that the SBA launch the program by issuing up to $500 million worth of flood insurance: then that with Presidential approval another $500 million be added July 1, 1957, and a third $500 million worth the following year.

The Senators also propose that a six-man advisory board from industry be set up to advise the Small Business Administration on program policy and administration.

Rem-Cru Titanium Inc has purchased five buildings at Midland, Pa, from **Crucible Steel Co of America,** will produce titanium mill products there.

Ferro Corp, Cleveland, has merged its subsidiaries, **Louthan Mfg Co,** East Liverpool, Ohio, and **Ferro Powdered Metals, Inc,** Salem, Ind.

Federal Products Corp, Providence, R I, has increased its sorting and gaging equipment manufacturing facilities by 24,000 sq ft.

W O Barnes Co Inc, Detroit, has completed a 9000-sq-ft addition to its saw-blade manufacturing plant.

Borg-Warner Corp has acquired **Byron Jackson,** Los Angeles manufacturer of pumps, oil tools and electronic equipment, will make it its Byron Jackson Division.

Baker-Raulang Division of Otis Elevator Co has purchased **Hupp Corp's** plant at 1250 W 76th St, Cleveland, adjoining B-R's plant. Three new types of industrial trucks will be manufactured there.

Gussett Boiler & Welding Inc, Canton, Ohio, has been purchased by J F Hattersley, former president of the Hoover Co, who will continue to manufacture tanks, pressure vessels and steel weldments.

General Electric Co's Lynn, Mass, plant will manufacture propulsion equipment for the U S S *Congress,* fifth Forrestal-class attack carrier.

Dana Corp, Pottstown, Pa, maker of automotive drive shafts and universal joints, has launched a four-year, $1.9-million plant expansion and machinery replacement program. About 50% of the plant's machine tools and equipment will be replaced or repaired under the program.

Lansdale Tube Co, subsidiary of Philco Corp, has purchased the Spring Lake, Pa, plant of Apex Hosiery Co, will use it to make electronic equipment.

Standard Tool Co, Cleveland, has added a complete line of cylindrical and thread gages, both plug and ring, to its products.

Companies in the News . . .

United Transformer Co, New York City, has opened its **UTC-Pacific Division** plant at 4008 W Jefferson Blvd, Los Angeles, where it will manufacture transformers and electronic equipment.

U S Industries Inc has acquired **Garrett Oil Tools Inc,** Longview, Texas, makers of gas lift valves and tank switching systems for oil fields, as a diversification move.

Mercast Mfg Corp, subsidiary of New York's Mercast Corp, has purchased an 18,000-sq-ft plant at La Verne, Calif, for $500,000, will make precision castings by the frozen mercury process there.

Wm S Bolden Co, Charleston, W Va, machine and power tool distributors, have moved into new, $130,000 quarters on MacCorkle Ave.

Clark Equipment Co, Michigan manufacturer of materials handling equipment, plans to establish a San Francisco Bay Area plant before year's end.

Besly-Welles Corp, Beloit, Wis, has acquired **Metro Tool & Gage Co,** Chicago, and **Lake Tool Co,** Crystal Lake, Ill. Lake Tool, which makes standard carbide tools, will remain in Crystal Lake. Metro's machinery and equipment will be moved to Beloit. Key personnel of both firms, which become divisions, will move to Beloit.

Whirlpool-Seeger Corp, one of the nation's biggest appliance firms, has been formed by combining **Whirlpool Corp,** maker of Sears Roebuck & Co's Kenmore washers, Seeger Refrigerator Co, maker of Sears Coldspot refrigerators, and **Delaware Appliance Corp,** a division of **Radio Corp of America** that manufactures air conditioners and stoves.

Copperweld Steel Co, Pittsburgh, plans a $12-million expansion of its steel making and steel finishing facilities. Most of the money ($10 million) will go into new roll and finishing facilities at its Warren, Ohio, plant.

Yale & Towne Mfg Co's Powdered Metal Products Division has purchased a 12,300-sq-ft plant at Addison, Ill, will make ferrite components for electronic equipment.

Walworth Co has purchased **Alloy Steel Products Co,** Linden, N J, one of the largest U S makers of stainless steel valves.

Addressograph - Multigraph Corp, Cleveland, maker of business machines, plans to expand its plant and office facilities 44%.

Superweld Corp, North Hollywood, Calif, has formed a subsidiary, **Western Carbide Corp,** at North Hollywood to manufacture hard-facing paste and bulk products.

Hall-Scott Motors Co, Berkeley, Calif, has purchased **Dynamic Analysis Co,** Los Angeles maker of desk-model electric computers, as a diversification move.

American Hardware Corp, New Britain, Conn, is using its subsidiary, **Corbin Lock Co of Canada Ltd,** to buy two old-line Canadian hardware manufacturing firms: **Peterborough Lock Mfg Co,** Peterborough, Ont, and **Belleville Lock Co Ltd,** Belleville, Ont.

ACF Industries Inc is taking over the Air Force plant at Rochester, N Y, formerly used by **A O Smith Corp** to make B-52 bomber components. ACF will install new equipment for manufacturing 8-in. shells.

Abbey-Etna Co is building a new $300,000, 200 x 200 ft, plant at Aveenue Rd, outside Perrysburg, Ohio, will transfer its tube machinery manufacturing facilities there from its 51-year-old present Perrysburg plant.

Friden Calculating Machine Co will add 44,000 sq ft to its San Leandro, Calif, plant.

Canadian Pratt & Whitney Aircraft Co Ltd, a subsidiary of **United Aircraft Corp,** has bought machine tools and equipment supplied for Canadian P & W's manufacture of Wasp piston engines, will also spend $1.5 million on capital goods to produce anti-submarine aircraft.

GOULD & EBERHARDT CHANGES . . . H Ezra Eberhardt (left), president, to chairman of the board, and treasurer; **Gustave E Spies,** vice president sales, to president. (*AM*, Aug 29, '55 p756)

George E Ellis, formerly manager of the modern tool works division of Consolidated Machine Tool Co, has been appointed general sales manager of Lipe-Rollway Corp, supervising activities of the machine tool and automotive clutch divisions

Names in the News . . .

R S Reynolds, Jr, director and financial vice president of Robertshaw-Fulton Controls Co, has been named board chairman to succeed his father, the late R S Reynolds, Sr.

Abe Haglund, formerly associated with Griffin Ross Machinery Co as a distributor for Axelson lathes in southern Calif, has returned to the Axelson Manufacturing Co, Los Angeles, as sales manager of the Milling Machine Div.

Floyd B Hagenbuch, manager of the service department of Wells Manufacturing Corp, Three Rivers, Mich, has been promoted to sales manager of the organization. **E H Van Loo,** factory service engineer, succeeds Mr Hagenbuch.

Dr David B Parkinson and **John H Harris,** both longtime associates of Brush Electronics Co, Cleveland, have been elected vice presidents of the company. Dr Parkinson will head design and production engineering, and Mr Harris will be responsible for manufacturing, production control, maintenance and materials procurement.

Harold G Warner, assistant works manager of Cadillac Motor Car Division, Detroit, has been promoted to works manager.

Westinghouse Electric Corp names: **Gwilym A Price,** president, to serve as board chairman and president; **Mark W Cresap, Jr,** vice president and assistant to the president, to executive vice president and deputy chief executive officer; **Latham E Osborne,** executive vice president, to vice chairman of the board; **John K Hodnette,** vice president, apparatus products divisions, to vice president-general manager of all product groups; **A C Monteith,** vice president in charge of engineering and research, to succeed Mr Hodnette; **Dr John A Hutcheson,** director of Westinghouse Research Laboratories, and a vice president, takes over Mr Monteith's post.

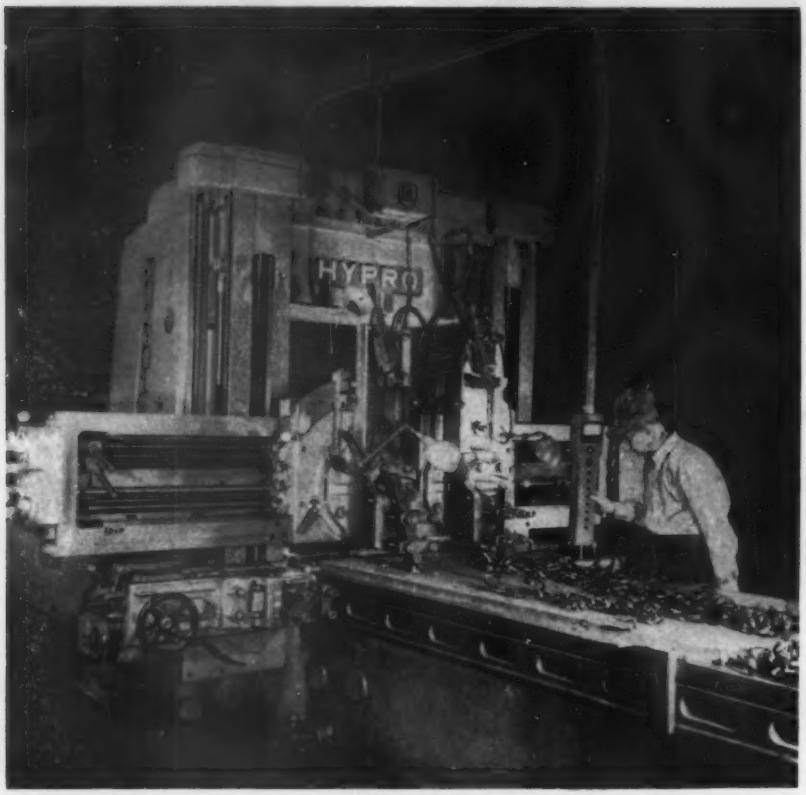
Harold A Daschner has been named managing director of the Pressed Metal Institute. He has been serving as assistant manager and acting managing director.

John B Kendall, manager of Ford Motor Co's Buffalo stamping plant, has been named to head the company's new plant in Chicago. **F J Bushroe** succeeds him.

LOUIS ALLIS CO NAMES . . . E P Allis (left), president, to chairman of the board; and **John W Allis,** vice president, to president

A C Erhardt, Jr, chief service engineer of National Tool Co, has been named director of sales

New Shop Equipment



Double-Housing G&L Planer Cuts at 400 sfpm, Weighs 40 tons

Planer introduced at the Machine Tool Show has 22-ft-by-49½-in. table, with a 48-ft bed. Machine has dual saddle and slide controls, power crossfeed to side heads, and electric rail clamp.

Other features are hydraulic table stops and jacks, twin helical-gear table drive, extra-high pneumatic tool lifters for rail and side heads, and large-dia drive shafts with antifriction bearings on all screws, feed rods, and rapid-traverse shafts.

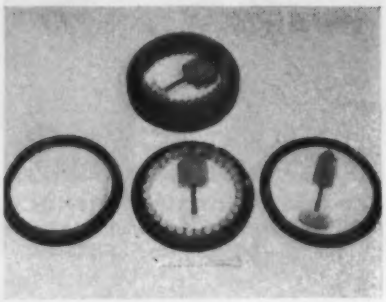
Planer drive has an adjustable-voltage motor providing speeds from 25 to 400 fpm. Drive includes low-inertia motor armatures and forcing action on low-inductance motor and generator fields for fast reverse. Fast motor and generator fields provide fast short strokes. The mg set has a double-capacity ac driving motor and the controller has high-speed relays, for fast, heavy-duty service.

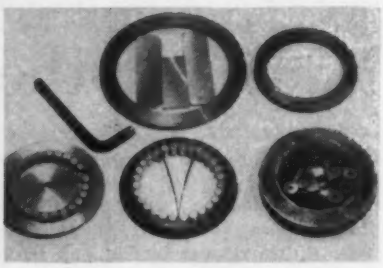
Planer controls include high-speed relays and rheostat speed adjustment in both directions. Lubrication is under pressure, through full-flow filter. Bed gearing is spray- or splash-lubricated, and oil pump is interconnected with main motor drive, which will not operate unless oil pressure is up.

Safety features include limit switch on rail up motion, stops to limit heads horizontally, safety clutches that prevent heads from running together or into work.

Interlocks prevent feed and rapid traverse from being engaged at same time on heads, and keep rail from being moved vertically when partially or fully clamped. Table stop prevents overtravel. Controls are grouped for convenience, most of them in the pendant, which includes a hp meter.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis





Screw-Loc Fixtures Hold Small Parts for Grinding

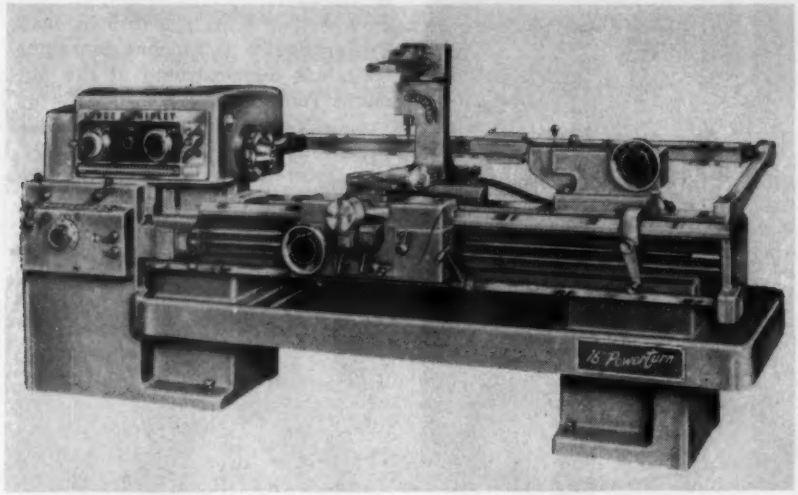
Three precision tool-steel rings and screw jack set up small regular parts for end grinding on surface grinder by containing the parts in a locked circle. Rings are 0.240, 0.370, and 0.490 in. high, and may be used for parts just higher than each dimension, or in combination for higher parts. Can be used on any surface grinder, reciprocating or rotary, using a magnetic chuck. Diameter range for gripped parts is ¼ to 1½ in.

Locking jack has square shank which is wrenched to tighten up between parts arranged in a circle, forcing them to expand evenly against the ID of the ring being used. This holds them firmly during grinding cycle, exposing their tops to the wheel. Setup can be flipped, loosened, and retightened with opposite part ends extended for second operation.

Rings are oil-hardened to 60-63R_c, ground all over. Standard set is at top, and special sets below it. Locking may be done with regular flat jack, or with cam or springs.

Vanstcel Products Co, Bemus Point, NY

Materials and Parts . . .



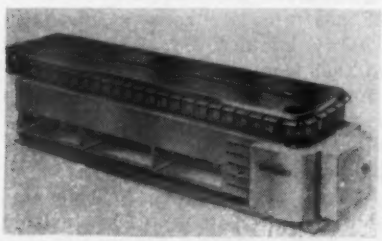
Lodge & Shipley Copymatic Lathes Offered in 45° and 90° Models

Copying lathes, 45° and 90°, have computing heads on which two dials are set to tell the correct settings of the three speed-shifting levers. All hydraulic lines are enclosed in a single conduit, and pushbuttons and control levers are grouped for easy operation. Both machines permit mounting either flat or round templets.

The 45° machine performs turning or facing, or a combination of both, and is offered in 6 models—engine, toolmaker, and gap, in 16- and 20-in. sizes. Tracing stylus is base-mounted, and tracing mechanism and templet support are new design.

The 90° machine, shown here, is available in engine, toolmaker, and gap models, in 13-, 16-, and 20-in. sizes. These machines are normally equipped with supports for round templets, to permit use of a prototype part as the templet.

Lodge & Shipley Co, 3055 Colerain Ave, Cincinnati 25, Ohio



Straight-Line Indexing Chassis For Assembly Operations

Transfer-design, straight-line, basic machine chassis in a range of standard models has been added to Swanson Tool's series of indexing units.

Auto-Tran provides a standard unit for application to automatic and semi-automatic assembly operations. It is designed with accessible faces for mounting operational devices for drilling, tapping, staking, etc. Hopper feeds can be mounted in any position around the chassis.

Unit is available with 48 to 72 carriers; 3-, 6-, 9-, or 12-in. index travel, and with either vertical or horizontal mounting surfaces on the carriers.

Carriers, attached to a double roller chain, have ball bearings mounted in both horizontal and vertical planes, guided in tracks on chassis frame. Smooth index is provided by Swanson cam-indexing unit which drives a sprocket incorporating a pin clutch for convenient disengagement, resulting in easy alignment of operational devices and tooling. Details in Bulletin A-5.

Swanson Tool & Machine Products Co, Erie, Pa

. . . including

MACHINE TOOLS AND ATTACHMENTS

Optical-contour grinder ..... page 196
2200-rpm drill ..... page 196
Knee-type miller ..... page 200
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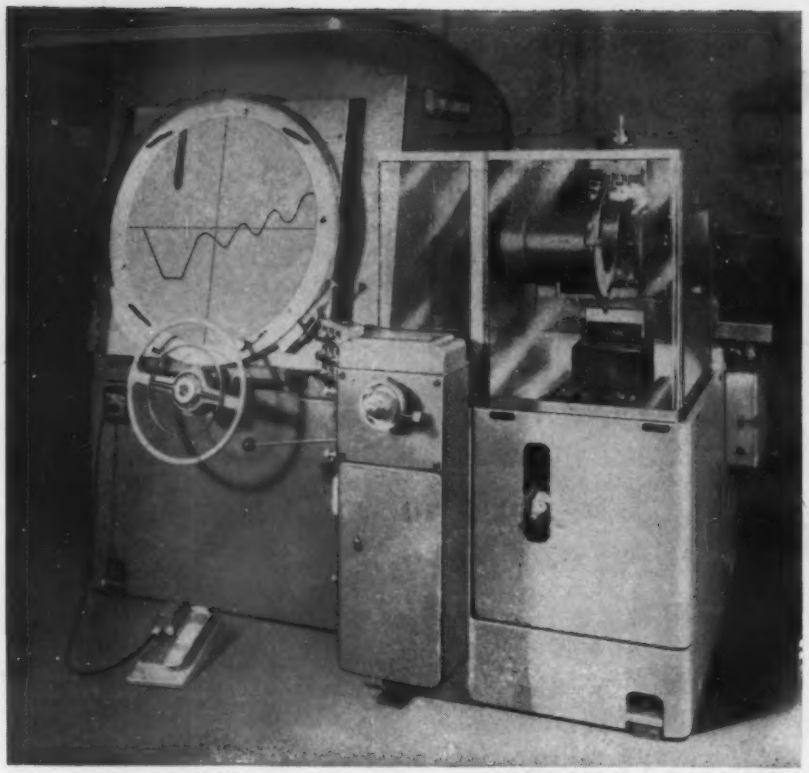


J&L Optical Contour Grinder Produces Parts From Drawings

Surface grinder has hydraulic tracer control coupled with 30-in.-screen comparator, and will produce profile-ground shapes directly from a line drawing, as well as from automatic tracer control.

Machine is made of two basic elements—a special surface grinder and the comparator. An outline chart of the work is mounted on the screen, and the image of the work is projected onto the screen. As the grinding wheel position is changed with respect to the work table, the projected image moves in the same direction and a proportional distance. The image of the grinding wheel is the projection of an auxiliary stylus located in the focal plane of the lens system. Its cross section is the same as that of the grinding wheel cutting edge.

Controls permit the operator to advance the grinding wheel along a given work contour, and the image is simply made to follow the outline chart mounted on the screen.

The grinding wheel can also be templet-controlled by master stylus and hydraulic tracer. Work first produced by manual and comparator control can thus be reproduced in quantity by automatic tracer control. on this machine.

In the comparator, two focal-plane styluses, representing the position of the grinding wheel, and separated by about 6 in., make it possible to grind contours from 6 to 12 in. long while using a 6-in.-dia lens system. There are 3 lens systems—5X, 10X, and 20X.

The grinder worktable oscillates from front to back, with adjustable stroke length and travel rate. The table can be raised or lowered by hand crank, with dial readings of 0.0005 in. The grinding wheel carriage, located above and to the rear of the table, is mounted on anti-friction rollers, with its movement providing lateral wheel feed across the worktable. Grinding wheel size range is 10 to 14 in.

Control of the wheel spindle position is hydraulic, whether grinding from templet or projected image. For direct reproduction, the finished part can be used as a templet. Contours up to 30° from vertical can be duplicated in this manner, as the wheel advances under mechanical feed. When grinding from a chart, the stylus displacement is manually controlled, and contours up to vertical can be ground.

Manual control wheel gives vertical adjustment of the grinding wheel. Lateral feed is mechanical, using the same drive, clutch, and brake as the reciprocating worktable. Ratchet feed of grinding wheel is adjustable to increments of 0.001 in. per stroke of the table.

Max grinding stroke is 6 in., and max grinding length of work is 12 in. Max grinding lengths of work with various lens systems are: 6 in. (5X lens); 3 in. (10X lens); and 1½ in. (20X lens). Range of height, table to wheel, is 4 in. min to 8 in. max. Truing device is tangent to radius. Unit was demonstrated at the Machine Tool Show.

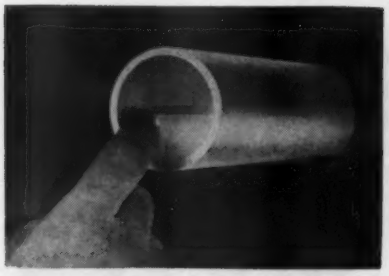
Jones & Lamson Machine Co, Springfield, Vt

Edlund Adds Two Models To "F" Drill-Tap Series

Models 1F and 4F added to 2F, announced earlier (*AM*—Mar 15 '54, p190), extend the range of this series of drilling and tapping machines. 4F has infinitely variable speeds to 2200 rpm, and will drill 1½-in. holes in cast iron. It has 12-in. overhang on pedestal models with from one to four spindles; is intended for heavy-duty continuous operation on a production line.

Model 1F sensitive drill has instant selection of infinitely variable speeds from 1250 to 10,000 rpm, or the optional range from 625 to 5000 rpm. Prepositioned depth gage helps control drill penetration, and adjustable spindle tension control gives operator feel during the operating cycle. Overhang is 7 in., capacity in cast iron is ⅜ in., and the drill is available with from one to four or six spindles. Unit was demonstrated at the Machine Tool Show.

Edlund Machinery Co, Cortland, NY



New Trent Welding Technique Eliminates Bead on ID of Tubing

Trent Tube Co, Crucible Steel subsidiary, has developed a process of manufacturing welded stainless steel and high alloy tubing and pipe with weld bead on inside diameter of tubing completely eliminated.

Rolls of the continuous mill are inverted; formed tubing is welded from the underside, and ID bead is eliminated by gravity. Even in the as-welded condition, tube is said to have a flawless interior surface. Extremely smooth inside provides a better surface for rolling in of tubes in tube sheets. Many of the high alloys or super alloys can now be rolled into tube sheets instead of welded in. Corrosion resistance has been improved because absence of valleys or grooves leaves no place for solids to deposit or corrodants to become entrapped.

Development of the technique has made possible the production of tubing in many alloys in a wider size range than previously produced, and the cold drawing of these alloys in extremely light walls. High-quality, full-finished tubing and pipe sizes can be produced in the various Hastelloy grades, zirconium, zircoloy, titanium, and 19-9-DL.

Trent Tube Co, East Troy, Wis

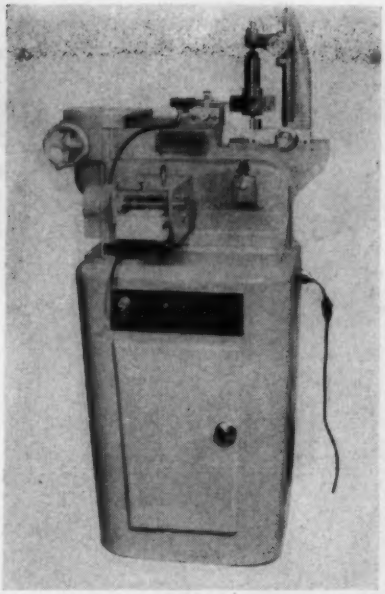
Low-Frequency Induction Heating Has Low Initial Investment

Low-frequency Mullins-designed induction heating method is said to be efficient, yet economical to install. Method is suitable for heating such work as billets, bolts, and rivets, to forging and annealing temperatures.

Heating medium is an induction coil using 60-c, single-phase ac. Auxiliary materials-handling equipment is eliminated, and in many installations mechanical pushers and conveyors are not needed.

Maximum capacity of an existing unit is 2000 lb of processed steel per hour, with energy consumption of 1 KWH per 14 lb of metal heated to 1350F.

Loftus Engineering Corp, 610 Smithfield St, Pittsburgh 22, Pa



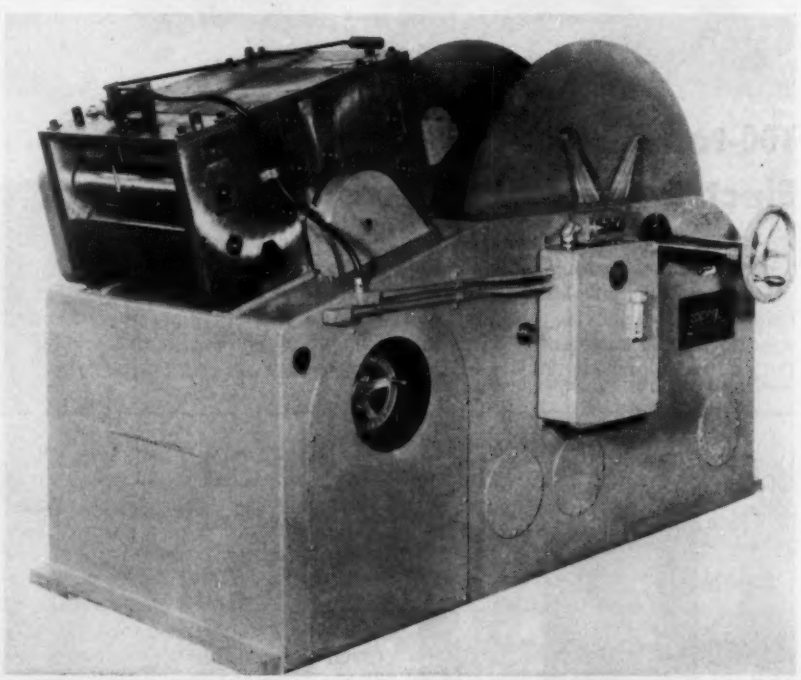
Gear Tooth Spacing Comparator Spots Errors Automatically

Machine automatically checks tooth-to-tooth spacing around a gear or similar piece of work. Gear can be checked while in motion; unit operates with a dual finger check, and is powered with an unusual mechanical arrangement. This action, combined with recording, reportedly indicates an accurate picture of spacing quality. It is possible to analyze and interpret the chart to indicate accumulated spacing and max out-of-position in errors of teeth.

Indexing of work gear or similar piece is accomplished by a fixed finger which moves in a circle. Checking finger contacts adjacent profiles approximately one circular pitch apart. Checking position is where measuring fingers are set at furthest depth of teeth usually along the pitch line. As machine travels, each tooth is checked for position, and graphed on a chart.

Using standard and special fingers, these tests can be made: tooth-to-tooth (spur and helical); PD run-out and size from hole; variations in tooth thickness; lead variation; and accumulated spacing.

Illinois Tool Works, 2501 N Keeler Ave, Chicago, Ill

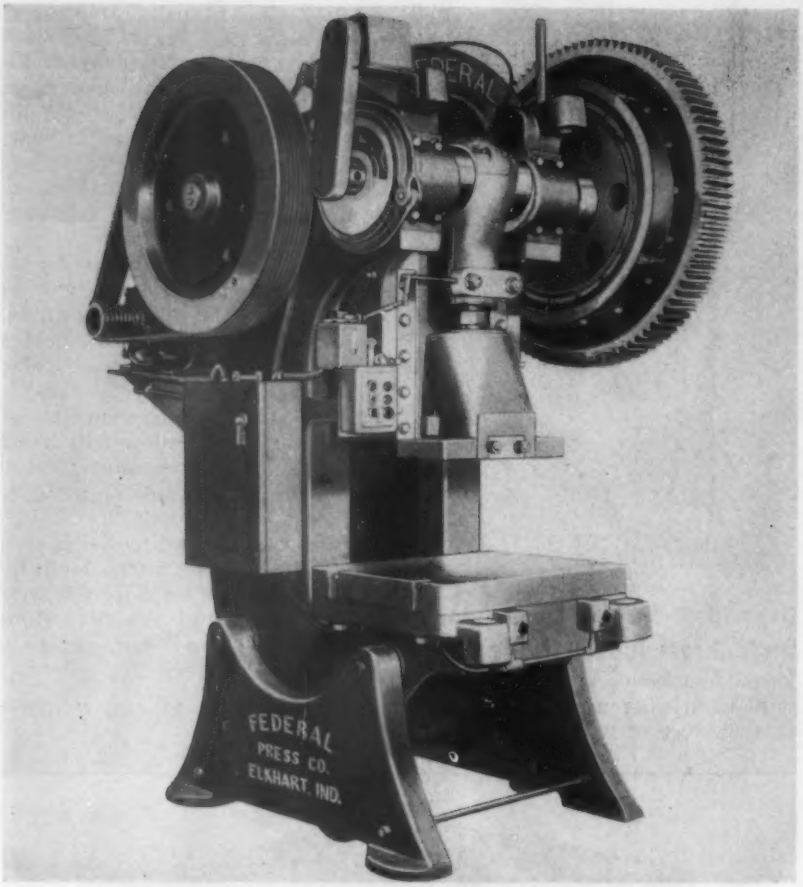


Cradle and Straightener Handles Work to 20,000-lb Weight

Models of this cradle and straightener are available for handling coils to 36 in. wide, 60 in. in diameter. Cradle (depending on customer's requirements) has either hardened rolls or a slot conveyor, and is powered by variable-speed reducer.

Rotating side plates, turning on Timken roller bearings, are said to prevent crimping or damage to edges of stock. Machine will handle stock to 3/16 in. thick, has 2 sets of powered driving rolls, and has either 5 or 7 straightening rolls.

Special Engineering Service, Inc, 8161 Livernois, Detroit 4, Mich

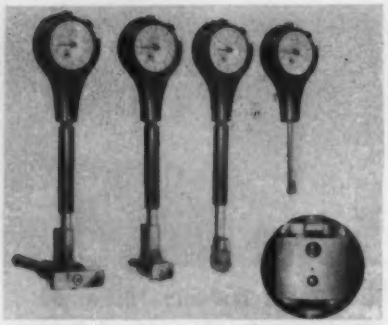


100-ton Federal Press Has Electro-Pneumatic Controls

No. 8 air clutch press has 100-ton capacity, and is equipped with electro-pneumatic controls. Twin solenoid valves provide safety to operator, while a system of lights on the control panel signals when the press is in safe operating condition.

Electro-Pneumatic control provides fingertip starting and stopping, and the press may be single-tripped inched, or operated continuously.

Federal Press Co, Elkhart, Ind



Federal Adjustable Hole Gages Have Positive Centralization

Model 1250P series of adjustable dial hole gages have a new design which is said to give positive, accurate centralization in the hole without careful lateral positioning.

Centralizing device is also said to permit setting gage without master rings, using gage blocks instead, with claimed transfer accuracy of 0.00005 in.

The four gages in this series have range of ½ to 8 in., the minimum size in each case being half the maximum.

Federal Products Corp, 1144 Eddy St, Providence, RI

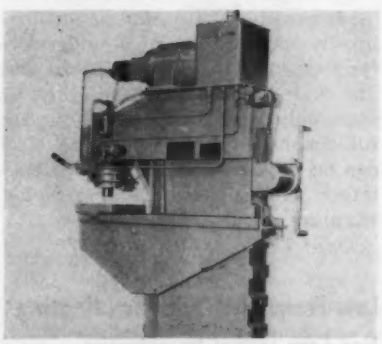
Resistance Welding Control

Line incorporates printed circuits and a weld-safe circuit for protection of equipment and work in process. Panel weight is reduced 30%.

Weld timer and sequencing circuit is designed to lock out current should tube failure occur at any time. Component locations and ratings are printed on panel front for easy inspection and servicing. Use of heavy-duty capacitors, rated at 600v (even though circuit voltages are normally 115v) are said to result in a 20% increase in control's operating life.

Ignition tubes are protected from excessive operating heat by thermostatic switch snap mounted on outer water jacket which locks out welding current at preset temperature. Inside sheet of jacket is designed so that thermal contact with thermostat is maintained.

Westinghouse Electric Corp, PO Box 2099, Pittsburgh 30, Pa



Hydraulic Gap Presses Incorporate Adjustable Bed

15 and 25-ton hydraulic gap presses have adjustable bed that can be raised or lowered for large or small pressing jobs by Wilson Tilt Lock that eliminates pins, bolts or blocks. On the hand-air-oil model, shop air pressure of 50 psi produces ram travel of eight inches per second.

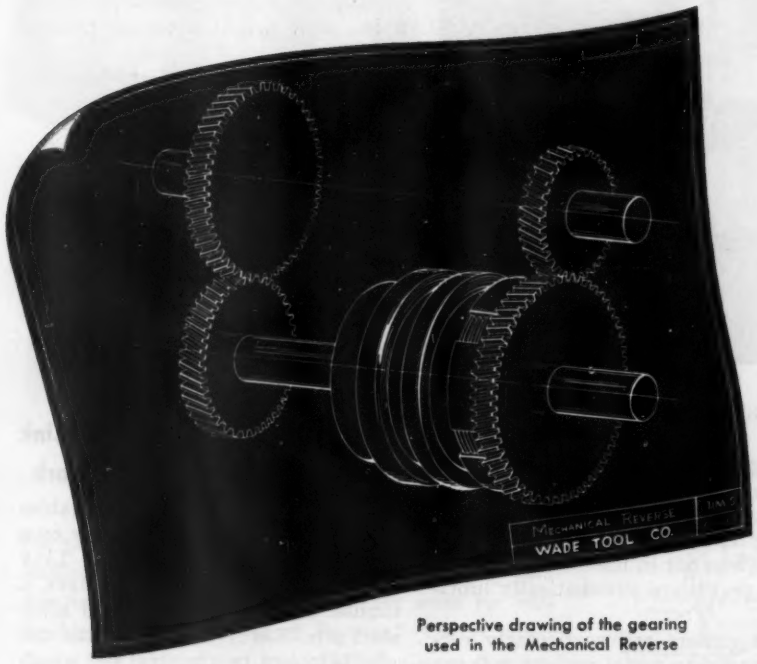
Motor-operated models provide adjustable hydraulic pressure on both downward and return stroke. Hydraulic gages are dual calibrated in pounds and tons so that the pressure applied can be read as accurately as needed.

K R Wilson, Inc, 215 Mill St, Arcade, NY

the Wade® REVERSE*

CONTINUOUS REVERSE

The arrow indicates the location of a feature that is built into the Wade #73, and **obtainable on no other second operation machine . . .** it's the production-tested **Mechanical Reverse.**



Perspective drawing of the gearing used in the Mechanical Reverse

no. 73 Hand Turret Lathe

A single lever mounted on the lathe bed not only controls the high-low spindle speeds of 5-to-1 ratio, but it also actuates the Mechanical Reverse. This lever brakes the headstock spindle and throws it into reverse **without stopping and starting the motor!**

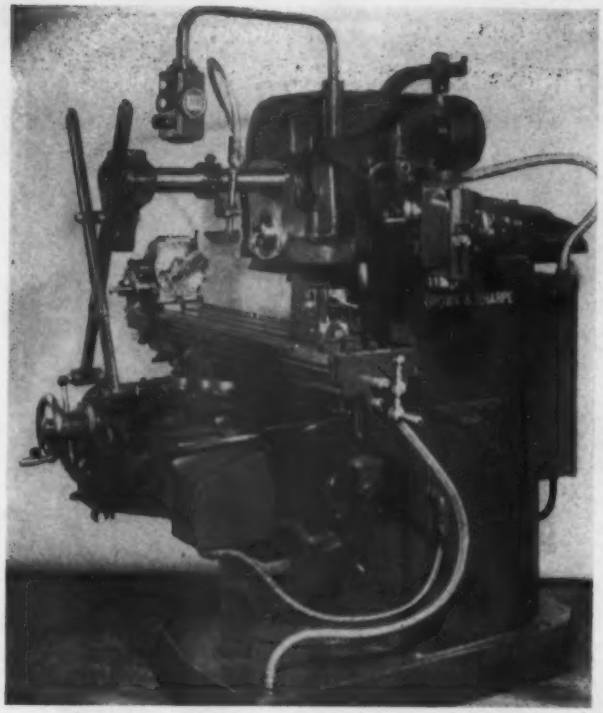
Cycles of up to 32 reversals per minute allow production increases of as much as 100% on your tap or die work.

If this feature interests you, investigate the full advantages of the Wade No. 73 by writing today for a circular illustrating this versatile machine.

*Wade Exclusive, Patent applied for *write for descriptive folder and prices* | **53 River St.**

THE WADE TOOL CO. | MAKERS OF PRECISION TOOLS FOR AMERICAN INDUSTRY

WALTHAM 54, MASS., U. S. A.



Brown & Sharpe Knee-Type Miller Reduces Setup Time

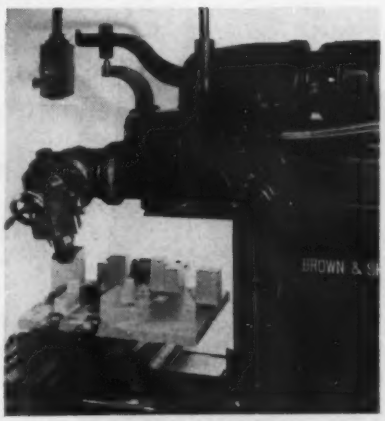
Rangemaster No. 20 universal and plain milling machines provide 3-hp spindle motor at either the main spindle in the universal milling head, giving wide range of production and versatility, according to the manufacturer.

The machine is characterized by a sliding head mounted on wide ways on the top of the column. Both horizontal spindle and fully universal milling head spindle are provided on the sliding member. The wide range of this machine is accomplished with the rigid cutter support and with the full horsepower of the spindle motor available at either the main spindle or the spindle in the universal milling head.

Horizontal, vertical, or angular milling can be performed, with 18 spindle speeds from 40 to 1530 rpm for the main spindle, and from 80 to 3060 rpm for the universal head spindle. As each spindle has a No. 40 milling machine standard taper nose, cutter equipment is interchangeable.

18 feed rates, from ½ to 20¼ ipm, are available for longitudinal, transverse or vertical feed of the table. In addition, the spindle of the universal head can be fed axially 3½ in. by hand.

The machine start and stop buttons, and the jog button for the spindles, are all grouped together on a movable pendant which can be located in any position convenient to the operator.

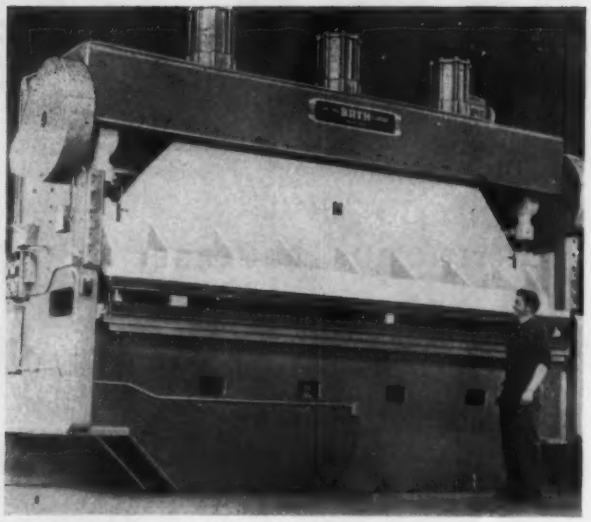


The universal head is carried on a jib arm so it can be swung to the side of the machine and bolted out of the way when not in use.

All points are automatically lubricated.

The millers are particularly recommended to metal pattern makers, mold and die workers, toolrooms, and manufacturers of prototypes, where the part must be securely clamped and then machined on many surfaces in different planes without disturbing the work.

Brown & Sharpe Mfg Co, Providence 1, RI

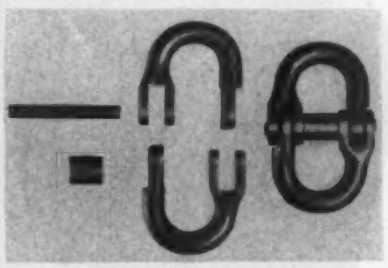


150-ton Press-Type Brake Forms Large Sheet Panels

Machine without die sets weighs 35 tons and is equipped with three air counterbalance cylinders. It has formica-lined slide areas, pneumatic clutch and brake, automatic overload release mechanism, press-type electrical safety controls with interlocked foot controls, which operate from either side.

Press can be used for piercing, blanking and shallow drawing unusually large sheet panels. Stroke is 5 in., shut height between platens is 14 in.

Cyril Bath Co, 32360 Aurora Rd, Solon, O



Columbus-McKinnon Coupling Link Permits User-Made Special Work

Coupling link, Hammerlock, enables alloy chain users to make their own sling and special assemblies. Link consists of a pair of body halves, a tubular stud, and a hardened alloy steel pin. Easily assembled, the device is locked by the steel pin which bites into the stud. No peening or welding is required. Design is intended to save the time formerly required for shipping new or repaired assemblies direct from factory.

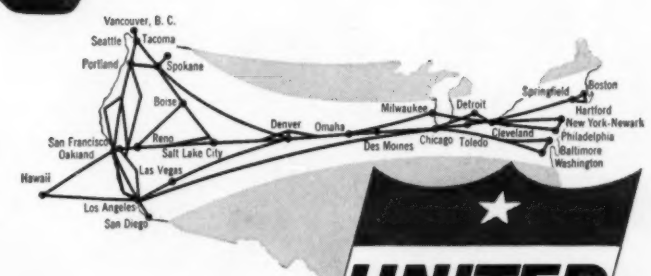
Columbus McKinnon Chain Corp, Tonawanda, NY

"We shipped this child's dress coast-to-coast by United Air Lines Air Freight for only 14 cents!"

"Time is all important to our salesmen," says Mr. Fred Rosenau, president of Rosenau Brothers, Inc., Philadelphia, world's largest manufacturer of children's dresses, "and we know we can depend on United Air Freight to get our dresses to them when needed. Then, too, shipment and delivery speed gives us more time here at the plant to incorporate the latest style trends and fabrics. The cost? Surprisingly low—about 14 cents to ship a dress coast-to-coast. All of which is why we use United Air Lines almost exclusively to ship to the West Coast and Hawaii."

United Main Line Airway follows the bustling business belt across the nation. At any point along this strategic route, United can furnish fast connections with other air carriers, truck lines and rail transportation to reach any section of the world. And only United offers Reserved Space Air Freight on all flights—more than 254 Mainliner® flights daily—not only over its own routes, but world-wide through connecting airline agreements.

For speed, dependability and economy, learn the advantages of United Air Lines Air Freight Service. Call the nearest United Representative or write for free booklet, "Industry's Flying Partner." Cargo Sales Dept. G-9, United Air Lines, 5959 S. Cicero Avenue, Chicago.

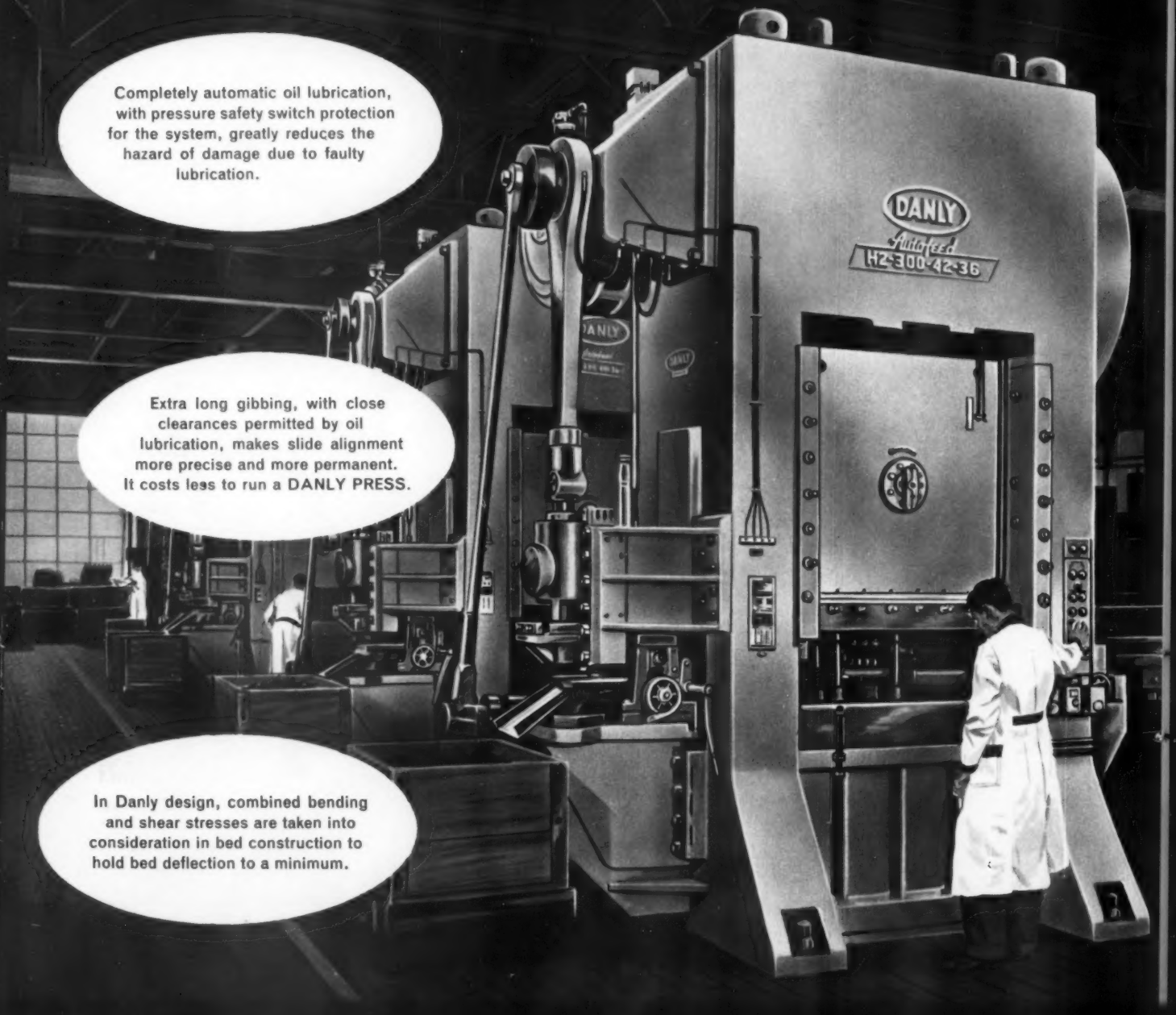


UNITED AIR LINES

Whatever your product—speed, dependability and low cost are yours when you ship by United Air Freight

comparison proves

DANLY AUTOFEED PRESSES MAKE HIGH PRODUCTION DIES LAST LONGER



Completely automatic oil lubrication, with pressure safety switch protection for the system, greatly reduces the hazard of damage due to faulty lubrication.

Extra long gibbing, with close clearances permitted by oil lubrication, makes slide alignment more precise and more permanent. It costs less to run a DANLY PRESS.

In Danly design, combined bending and shear stresses are taken into consideration in bed construction to hold bed deflection to a minimum.

USE THIS CHECK LIST

...Compare Danly Presses, feature for feature, with any other press on the market.

COMPARE	FEATURE	DANLY	OTHER
INSTALLATION COSTS	Danly presses are delivered already "run-in" tested. Faster installation is assured by assembly and operation in the Danly plant.	✓	
DRIVE	Danly's cool-running clutch lasts up to 7 times longer. Herringbone type gears and anti-friction bearings on high speed shafts wear longer.	✓	
CONSTRUCTION	Danly presses are made entirely of heavy stress-relieved steel weldments. Extra heavy internal ribbing decreases deflection.	✓	
LUBRICATION	Danly features completely automatic oil lubrication. When any vital area is not being sufficiently lubricated, safety switch stops press.	✓	
MAINTENANCE	Performance records in the country's biggest stamping shops prove that Danly Presses require less maintenance, greatly reduce spare part needs.	✓	
CONTROLS	Special Danly Control arrangements make operation easier and safer, minimize accidental damage, facilitate automation—can be completely enclosed.	✓	

. . . that's the report received from one of the world's leading manufacturers of conveyor systems and materials handling equipment. Their comparison of Danly press features against all others, led them to install Danly Autofeed Presses in critical production lines.

Today, after more than six years of high speed production, these Danly presses have required *no major maintenance*. Set-up men prefer the Danlys too, for their *accuracy* of *slide alignment*. Die-setting is easier and faster. Precision dies are better protected against wear, last longer because *vibration and deflection are greatly reduced*. Exacting piece part tolerances of plus or minus .001 are maintained through continuous production runs. This is in spite of the heavy tonnage requirements of off-center coining, piercing and blanking through three stage dies.

Danly presses can provide you with the same amazing economy and dependability of operation. Use the check list in this advertisement . . . make your own point-by-point comparison and see why Danly presses will give increased production at lower cost.

It costs less to run a DANLY PRESS

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

DANLY®

Today's new lightweight portable grinders need this kind of wheel!

The new lightweight

U. S. ROYALITE

HARD SHELL CUP WHEEL

"X-ray" view of wheel shows pronged anchor bushing and safety ring.

Here a worker uses a lightweight grinder with a U. S. Royalite Hard Shell Cup Wheel, to remove weld butt and to clean up welded structural steel member.

Removing weld flash from fabricated steel component for atomic reactor. Careful dressing of weld flash was required to obtain smooth surface for joining with other components.

Contour grinding (to template) for smooth surface joint between components for atomic reactor. Component is of fabricated steel.

This great wheel is powerfully reinforced by a pronged anchor bushing and safety ring assuring a safer and smoother-running cup.

The U. S. Royalite® Wheel is "job-geared" for these modern lightweight portable grinders. Royalite's free cutting face has a tougher rim, which keeps the edge sharp for the full life of the wheel.

EXTRA DIVIDEND: Remember that when you buy wheels from a United States Rubber Company salesman you are dealing *direct* and are being served by a specialist—a man whose only job is selling and *servicing* abrasive wheels. He will see that you get maximum value out of your abrasive wheel dollars.

• • •

The combination of the *lightweight* grinder and the *safer*, smooth-running U. S. Royalite Wheel means a better job in less time—with less worker fatigue.

"U. S." Research perfects it..."U. S." Production builds it...U. S. Industry depends on it.

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

FYI

FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 DEBURRING & CHAMFERING MACHINE—*Modern Industrial Engineering Co, Detroit 25, Mich.* 2-page illustrated bulletin 103-103 covers Burr-Master BMI-15 for production operations on internal gears and splines from 2 to 20-in. PD, available with automation for high-volume work.

2 ULTRASONIC IMPACT GRINDER —*Raytheon Manufacturing Co, Waltham 54, Mass.* 12-page bulletin illustrates and describes Model 2-332 series for machining hard or brittle materials Operational principles, features, applications, performance data, specifications, price list included.

3 PRESSES—*Clifton Hydraulic Press Co, Clifton, NJ.* 40-page catalog 14 contains illustrated information on vertical, horizontal, column, side frame units with Unitrol hydraulic circuit. Features, specifications, applications, tabular data provided.

4 3-WAY GEAR CLASSIFIERS — *Michigan Tool Co, Detroit 12, Mich.* Illustrated bulletin 355 describes operation and design machines for automatic monitoring of oversize, undersize, and correct size gears. Variations of the model described for monitoring other properties.

5 POWER SQUARING SHEAR — *Economy Tool & Gage Co, Chicago 30, Ill.* 4-page illustrated folder describes Model P-16 series with 36 to 52-in. cutting length, 16-gage mild steel capacity. Foot power shear F-18 for 18-gage steel also covered.

6 HYDRAULIC GAP PRESSES—*K R Wilson, Arcade, NY.* 4-page bulletin 79 pictures and describes hand-air-oil, and motor-operated adjustable-bed units of 15 and 25-ton capacity.

7 HYDRAULIC RAM UNITS—*Modern Engineering Service Co, Berkley, Mich.* 4-page folder describes Jacy units for piercing irregular parts and other press operations. Each unit contains a cylindrical ram to which varied press tooling may be attached. Applications, features, ordering information included.

8 TOOL & CUTTER GRINDER—*Homestrand, Inc, 9 Larchmont, NY.* 6-page catalog covers Thorns Universal T2 unit. Includes specifications, technical data, illustrated applications, descriptions of helix-grinding equipment.

9 SELF - LOCATING PRECISION BORING MACHINE — *Marac Machinery Corp, Yonkers, NY.* 6-page folder provides illustrated information on the KBF2 vertcial boring and milling unit with preselective fully automatic positioning. Program direction of machine by punched card system is optional equipment.

10 PRESS ROOM EQUIPMENT—*Sesco Inc, Detroit 4, Mich.* 4-page catalog presents illustrated information on combination cradle and straightener; centering reel; scrap cutters; punch press gripper feed units; stock straightener; rewinders.

TOOLS AND ACCESSORIES

11 DI-ACRO ROD PARTER—*O'Neil-Irwin Mfg Co, Lake City, Minn.* 14-page manual illustrates how tool cuts round, square, rectangular, and hexagon bar stock without rough edges or burr. Processes cold rolled steel, chrome molybdenum, stainless, full hard copper, brass, aluminum, and other bar stock up to ⅝ in. Specifications and capacities for both hand and power-operated units listed in tabular form. Includes operating and maintenance instructions, and complete parts list.

12 SAWS & KNIVES—*L S Starrett Co, Athol, Mass.* 60-page catalog 1053 illustrates and describes complete line. Application data and reference tables cover hand and power hacksaw blades, frames; hole saws, screw slotting saws; metal and wood cutting bandsaws; band knives for soft or fibrous materials.

13 DRILL, REAMER, & TAP CHUCKS —*Scully-Jones & Co, Chicago 8, Ill.* 8-page illustrated bulletin 1-50 describes newly-designed line including 4-slot design for increased resistance to pullout and greater protection against tool breakage. Size, dimensions, price and application data included.

Name .....
Title .....
Company .....
Co. Address .....
.....

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AMERICAN MACHINIST, 9-26-55 *Not good after* Nov. 26, 1955

Name .....
Title .....
Company .....
Co. Address .....
.....

FILL IN BELOW NUMBER OF ONE CATALOG WANTED ○

AMERICAN MACHINIST, 9-26-55 *Not good after* Nov. 26, 1955

Name .....
Title .....
Company .....
Co. Address .....
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Reader Service Department
American Machinist
330 W. 42nd St.
New York 36, N. Y.

Place 3¢ Stamp Here

Reader Service Department
American Machinist
330 W. 42nd St.
New York 36, N. Y.

Place 3¢ Stamp Here

FYI
FOR YOUR INFORMATION

14 STRIP-CHART RECORDERS—*The Bristol Co, Waterbury 20, Conn.* 12-page illustrated bulletin covers line of 6-in. recorders for pressure, liquid level, temp, flow, and mechanical motion. Includes features of various models; installation drawings show methods of applying instruments to different variables.

15 STANDARD CARBIDE BLANKS—*Carboloy, Dept of General Electric Co, Detroit 32, Mich.* 8-page illustrated catalog GT-292 covers blanks for clamp-on tools, solid carbide on-end inserts, round and square inserts, and triangular and square throw-away insert blanks.

16 ULTRASONIC GAGE—*Branson Instruments, Inc, Stamford, Conn.* 4-page folder describes "Vidigage" for measuring thickness instantaneously from one side of material. Operating principles, applications, and features illustrated and outlined.

● MAGNETIC NUT RUNNING & SCREWDRIVING TOOLS — *Apex Machine & Tool Co, 1028 S Patterson Blvd, Dayton 2, Ohio.* Catalog 25 contains data on complete line. Includes magnetic sockets for variety of uses; bit holders and hand drivers with range of insert bits. Request direct on company letterhead.

HEAT TREATING AND WELDING

17 PYROMETER SERVICE TIPS—*Barber-Colman Co, Wheelco Instruments Div, Rockford, Ill.* 11-page bulletin F7259 outlines variety of erratic performances and provides suggestions and solutions for correction.

18 3-PHASE RESISTANCE WELDING —*Sciaky Bros, Inc, Chicago 38, Ill.* 4-page bulletin describes principle of operation; advantages illustrated by graphs.

19 METAL HEAT TREATING UNIT—*Ipsen Industries, Rockford, Ill.* Illustrated bulletin RT-10 describes the 25-lb/hr laboratory Model RT-25-E for complete and accurate duplications of large furnace operation. Features described, specifications provided.

PLANT SERVICE EQUIPMENT

20 HIGH VACUUM PUMPS — *New York Air Brake Co, Kinney Mfg Div, Boston 30, Mass.* 52-page catalog 425 illustrates complete line. Contains engineering data, tables, graphs, conversion charts on units from ¼ to 40 hp.

21 AUTOMATIC MACHINE FEED UNITS—*F Jos Lamb Co, Detroit 7, Mich.* 7-page booklet presents illustrated description of uses for "Stor-Matic Hitch Lift" equipment for materials handling in connection with standard machines.

22 LIFTING MAGNETS—*Stearns Magnetic Inc, Milwaukee 46, Wis.* 8-page bulletin 35-C provides selection information, size and operating data, specifications and dimensions. Features and applications illustrated.

23 AUTOMATIC IMMERSION PROCESSING EQUIPMENT—*Frederic B Stevens, Inc, Detroit 16, Mich.* Folder contains illustrated material on bright dipping of aluminum and/or brass. Descriptions of two operations presented; labor, acid, and space-saving costs detailed.

24 SLING CHAINS — *Campbell Chain Co, York, Pa.* 15-page illustrated catalog S-555 covers single, double, triple, and quadruple types in three grades. Complete ordering information, specifications, attachments, maintenance included.

PARTS AND MATERIALS

25 MINIATURE BALL BEARINGS—*Miniature Precision Bearings, Inc, Keene, NH.* 24-page illustrated catalog describes and tabulates by bore size over 500 standard radial bearings. Performance data, torque, speeds, tolerances discussed; mounting and maintenance data included.

26 SPECIALTY STEELS — *Carpenter Steel Co, Reading, Pa.* 32-page illustrated guide defines distinctive characteristics in terms of end use. Covers tool and die steels, stainless, silicon and high nickel alloys, special purpose alloy steels, tubing and pipe, fine wire specialties.

27 SOCKET SCREW PRODUCTS — *Strong, Carlisle & Hammond Co, Mac-it Screw Div, Cleveland 13, Ohio.* "Handy Data File" for wall attachment contains illustrated data on 7 types of socket screws and hex-socket keys. Includes dimension standard, standard sizes, physical properties, recommended tightening torque, applications and uses.

28 PACKAGE DRIVES—*Allis-Chalmers Manufacturing Co, Milwaukee, Wis.* 8-page illustrated bulletin 51B8166 describes features of drives for speed control of machine tools and other applications requiring accurately variable speed over wide range. Available in 5 cabinet sizes with drive motor range 5 to 150 hp.

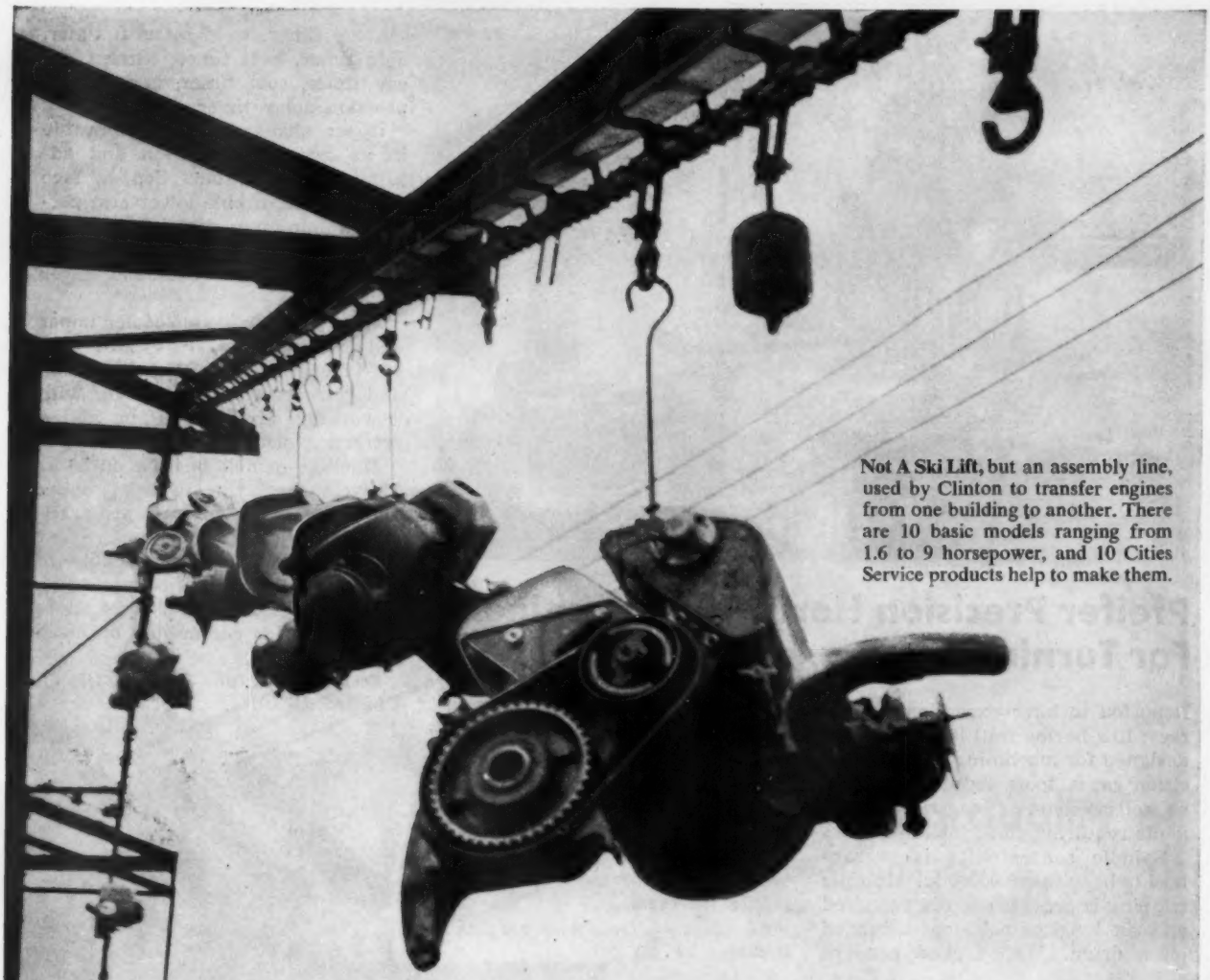
29 VACUUM MELTED METALS & ALLOYS—*Carboloy, Dept of General Electric Co, Detroit 32, Mich.* 23-page bulletin VM-101 includes general information and technical data. Covers effects of vacuum melting on properties of various metallic materials, advantages, fabricating and machining recommendations.

30 ALUMINUM ALLOY SELECTOR—*Howard Foundry Co, Chicago 39, Ill.* Slide rule shows common designation, applicable specifications, physical and mechanical properties for all major aluminum casting alloys for sand and permanent mold castings. Relative properties given for corrosion resistance, machinability, suitability for welding.

31 FASTENERS—*Southern Screw Co, Statesville, NC.* 30-page illustrated catalog MST-1 describes line including machine screws and A&B tapping screws, Phillips and slotted, and stove bolts, available in steel, brass, silicon bronze, aluminum, and stainless.

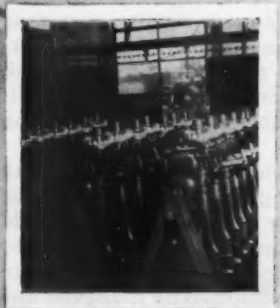
32 BRONZE BEARINGS — *Kingwell Bros, Ltd, San Francisco 1, Calif.* Centennial catalog 55 covers Kingwell bearings and bar stock, Chrysler Ollite bearings and bar stock, and Asarco continuous cast bronze bar stock. Complete listings of sizes itemized for each line.

33 ALUMINUM ALLOYS — *Peter A Frasse & Co, New York 13, NY.* 6-page illustrated brochure gives general properties, fabricating characteristics, applications, and available size ranges of each. Includes weight comparison and temper designation charts.



Not A Ski Lift, but an assembly line, used by Clinton to transfer engines from one building to another. There are 10 basic models ranging from 1.6 to 9 horsepower, and 10 Cities Service products help to make them.

"3,000,000 ENGINES IN EIGHT YEARS... CITIES SERVICE PLAYED MAJOR ROLE."



Outboard Motors are one of the chief products of Clinton Machine Company. Others include chainsaws and many types of gasolene engines for small power requirements.

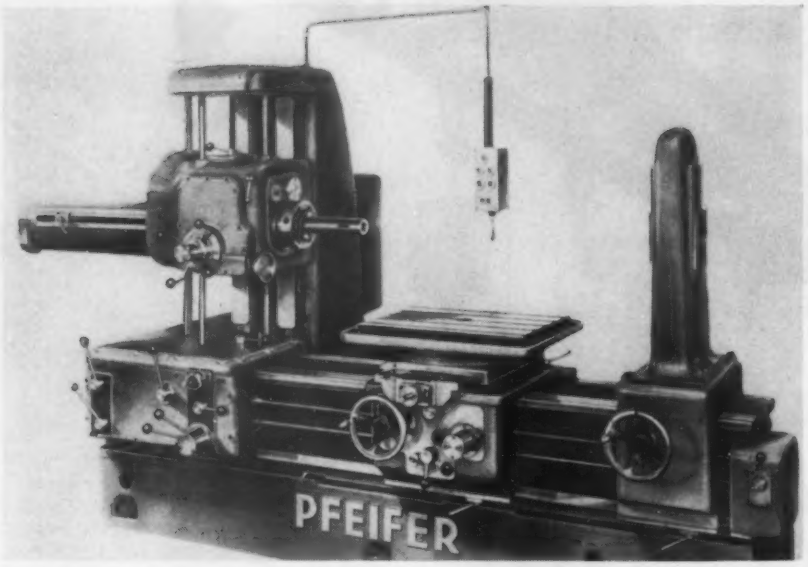
Phenomenal is the word for Clinton Machine Company, Clinton, Michigan. Formed in 1946, it has expanded so rapidly that today it claims second place among U. S. producers of air-cooled gasolene engines and has already marketed 3,000,000 of these and other engines.

Were there lubrication problems? Of course. "But," says President Don Thomas, "I am happy to say they have continually been taken care of by Cities Service from the very beginning. In these formative years, Cities Service engineers came to our plants and recommended the proper lubricants for both our production machinery and the products we make. Thus, for the past eight years, we've used Cities Service Chillo Cutting Oils, Trojan Greases and Pacemaker Oils with complete satisfaction. We don't hesitate to say that the cooperation and outstanding service offered by Cities Service plus the quality of its products has played a major role in helping us build the Clinton Machine Company."

Time and again manufacturers like Clinton report unusual results using Cities Service Lubricants. Find out why. *You* may profit, too. Talk with your local Cities Service Lubrication Engineer or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

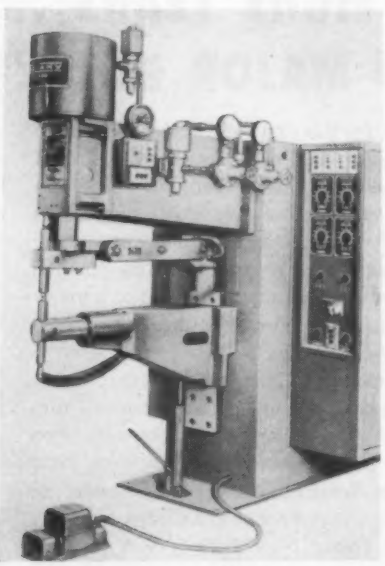


Pfeifer Precision Horizontal Machine For Turning, Boring, and Milling

Reported to have exceptional accuracy, this boring mill is particularly designed for machining of ultra precision gages, tools, fixtures and jigs, as well as short or long run components requiring close tolerances.

Spindle concentricity is guaranteed to be within 0.00008 in. Multiple tripping is provided by six crossfeed and six longitudinal stops arranged on a drum. Walk-around pendant controls are centrally located. Built-in rotary index table has working surface of 20 x 26 in.; rotation through 360°; cross travel, 20 in.; longitudinal travel 30 in. Distance of spindle nose to backrest is 51 in. Four covered and hardened bed ways are said to provide vibration-free saddle traverse.

Bernhard Pfeifer & Sons, 132 54th St, Brooklyn 32, NY



"Tailored" Rate of Current Decay Is Vital to Weld Quality

Sciaky three-phase Modu-wave PMCO 2ST spot welder tailors welding current to a wide range of low carbon steel, austenitic steel, aluminum and magnesium alloys, air hardenable, and stainless steels. Spitting and electrode-tip deterioration is eliminated by controlled current rise; quality welds are provided by a continuous wave which may be altered to suit thin or thick materials.

Re-crystallization of the metal during the cooling period is controlled by a knob adjustment, providing weld nuggets without internal stresses and cracks. Where large differences of gage thicknesses exist, uni-directional current is used to balance nugget penetration.

Heavy gage ferrous alloys are welded by using a pulsating cycle, and the magnitude of the weld and forging pressures are controlled by variable pressure cycle. Diaphragm-type welding head provides follow-up of welding pressure and rapid forging.

Component parts, tubes, relays, wiring, and transformer compartments are accessible in electronic panels. Control functions include squeeze timer, weld interval timer, hold timer, heat timer, current decay timer, cool timer, and recompression delay timer.

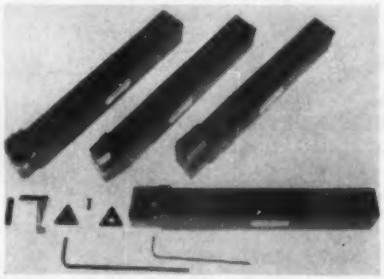
Upper shank holder is movable in its horizontal position and adjustable in and out. Copper face plate and adjustable lower arm permits a minimum distance of 9 in. and a maximum distance of 20 in. between conductor bars and lower horn.

The 1½-in.-dia water-cooled upper and lower shanks are ejector type for taper electrodes. Total welding and retraction stroke is 4 in. with a working stroke of ½ in. and a retraction stroke of 3½ in.

Machine models operate on 50 or 25-cycle frequency. Special upper and lower arms and horns are available for specific applications.

Type PMCO 2ST is capable of producing 100 welds per minute on two thicknesses of 0.040 light alloys and 130 welds per minute on clean mild steel.

Sciaky Bros, Inc, 4915 W 67th St, Chicago, Ill



Carboloy Toolholder Provides Throw-Away for Insert Blanks

Carbide pad for throw-away insert blanks gives cutting tools less overhang and greater rigidity, according to the manufacturer. Chip interference and projections under shank are eliminated, while screw adjustment on holder indexes the cutting blank.

Adaptable to special tools with cutting angles other than negative, to positive or neutral rakes, or to multiple-insert holders. Style A for internal boring and chamfering includes types to handle triangular and round inserts. Style B for internal facing, turning, and chamfering handles 30° triangular and 15° square inserts. Style G is offset type for triangular inserts for facing. Style F is for parallel turning, straddle and perpendicular facing, and recessing. Style D, with 30° lead angle, is for contour turning and lead angle cutting.

Carboloy, Dept of General Electric Co, Detroit 32, Mich

Two types of Krueger and Hudepohl clips, and strips showing progressive stages in fabrication.

Spring quality of REVERE PHOSPHOR BRONZE makes solderless connections possible

It is not always the case that solder has to be used to make good electrical connections. Often phosphor bronze clips can be used, tightness being achieved through the hard-gripping spring quality of this metal. Take the clips made by Krueger and Hudepohl, Inc., Cincinnati 2, Ohio. This company uses Grade A 5% Revere Phosphor Bronze to make its connections for refrigerators, and for submersible pumps and hydraulic control units. Such services require not only tight permanent connections, but the ability to withstand severe temperature variations, as well as vibration. Revere Phosphor Bronze meets the needs perfectly. In developing this application, the Revere Technical Advisory Service collaborated closely with the customer on the important matter of temper required both for fabrication and end use. Krueger and Hudepohl report no rejects. The metal is supplied in the form of strip, one inch wide, and in very long coils, so that down time for coil set-up on each progressive die machine is minimized. Send for your free copy of "Revere Phosphor Bronze," which provides details about qualities, performance, and applications.

REVERE

COPPER AND BRASS INCORPORATED

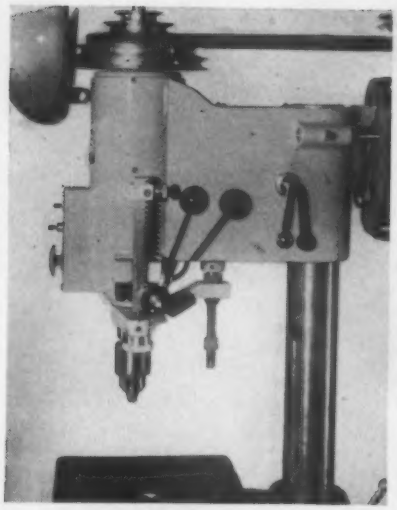
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

* * *

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere.

"The Revere Four-Way Service" is a 16mm sound motion picture in color, interesting and informative. If you would like to see it, write nearest Revere Sales Office.



Air Hydraulic Drillpress Head

Integral unit offers choice of completely automatic operation, or by shutting off air pressure and inserting removable drillpress handle, manual operation for odd-lot drilling jobs.

Designed primarily to operate on 30 to 40 lb of air pressure for average single-spindle operations, a large reserve of gage pressure is available for use in multiple-spindle drilling. This is achieved without loss of stroke length when drill head is attached to quill because of extra-length quill used, which has a projection below the thrust plate to permit clamping on head.

Features include: forward hinging pulley guard which makes belt changing readily accessible; micro-depth adjustment by means of calibrated knob and rapid approach adjustment, external and infinitely adjustable; simplified electrical control panel. Units are easily installed on any round drillpress column.

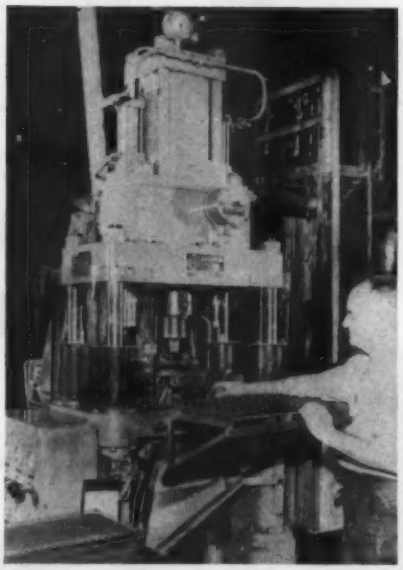
Rotafeed Co, 2820 E Grand Blvd, Detroit 11, Mich

Single-Mast Assembly For Hyster Lift Trucks

Monomast can be field-installed on current 3000 and 4000-lb Hyster Models UC-30 and YC-40 without alteration. Wide visibility resulting from the single upright assembly is said to permit faster operating speed, maneuverability, and approach, more accurate load placing, and safer handling because of clear, unobstructed view of both forks and load.

Upright consists of two telescoping box-type sections. Total weight is about the same as standard assemblies, but tubular design is said to be stronger than comparable models. Torsional rigidity is claimed to have been increased 80%, and mast deflection reduced 50% over conventional upright assemblies. Design allows a 15% increase in hoist speed. Slight horizontal carriage flotation permits truck to angle back out of tight positions after load depositing. All standard hydraulic attachments can be mounted on the carriage; non-hydraulic attachments are also available.

Hyster Co, 2902 N E Clackamas, Portland 8, Ore



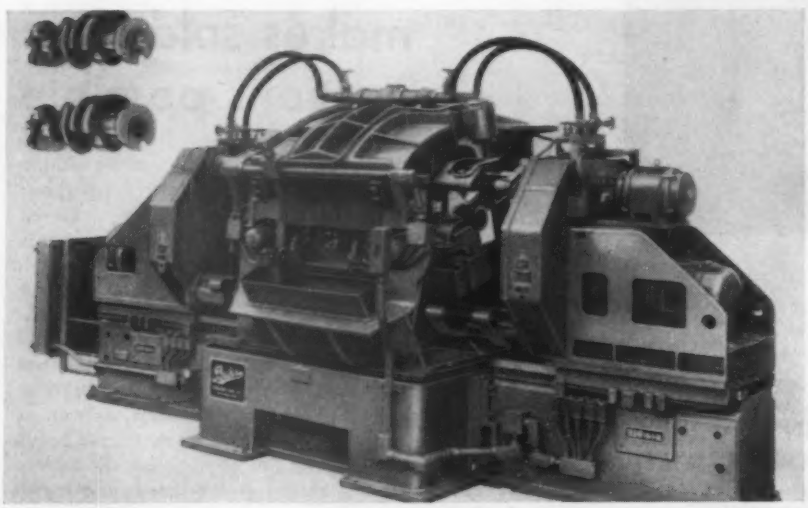
Metal Powder Compacting Press Minimizes Finishing Time

Model L, 50-ton press saves metal wasted in finish grinding by holding dimensional tolerances to finished specifications, according to the manufacturer. Since smaller dies can be used, less metal needs to be ground from compacted and sintered parts.

Ford Motor Company reports production tolerances of 0.0025 in. on eccentricity between ID and OD, and 0.001 in. plus or minus on length, in production of oil pump gears. Tool life of dies and punches is said to have increased, with an output of 900 gears per hour.

Downtime is minimized with no cam changes. Longer tool life is attributed to the rigidity of the frame, and heavy bearings and guides functioning with the moving parts. End squareness and concentricity of the part is reported due to punches and core rod parallelism with the die.

Baldwin-Lima-Hamilton Corp, Philadelphia, Pa



70 PLYMOUTH ENGINE CRANKSHAFTS per hour (at 100% efficiency) are machined including 30 LH and four RH-slide operations, on 2-way Buhr Economatic. Features Powerflo indexing, clamping of fixtures by power wrench with torque control, multiple heads of master-gear-box construction with individual cluster heads. Bushing plates register into fixtures at each station. Parts are held to tolerances and are interchangeable — *Buhr Machine Tool Co, Ann Arbor, Mich*

NEW

No. 3-36 . . . 36" table travel . . . 64" x 16" table . . . full automatic hydraulic feed.

No. 3-36

HYDRAULIC MILLING MACHINE

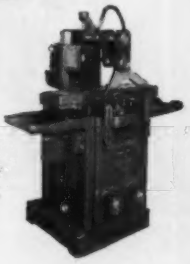
Now—the family of Kent-Owens Milling Machines has expanded to give you the same unexcelled milling accuracy, speed and dependability for *larger size work!*

Proudly we present the No. 3-36 Hydraulic Milling Machine . . . the new "big brother" in the line of popular Kent-Owens Millers. Each Kent-Owens machine is ruggedly designed with advanced features throughout for greater dependability and accuracy to maintain tough production schedules. Write for bulletin 955 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines.

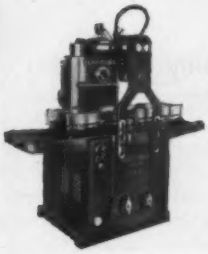
Kent-Owens Machine Co., Toledo, O.

Simple . . . Rugged . . . Efficient

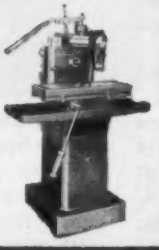
No. 2-20DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42" x 12" table. Hydraulic feed.



No. 1-14 . . . 14" table travel . . . 32" x 9" table . . . hydraulic table feed . . . full automatic cycle.



No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.



No. 1-M . . . Hand feed to table and head . . . 25" x 9" table . . . 12" table travel . . . head counter-balance is adjustable.

Call on

KENT-OWENS

for MILLING MACHINES

KENT-OWENS REPRESENTATIVES

BOSTON
Universal Machinery Corp.

BUFFALO
Jewett-Hoffmann Machy Co.

CHICAGO
Geo. Scott Machy Company

DALLAS
Thomas Machine Tool Co.

DAYTON
C. H. Gosiger Machy Co.

DETROIT
L. C. Hoffmann Machy Co.

FT. WAYNE
Owen Machinery Co.

GRAND RAPIDS
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HAMILTON, ONT.
F. F. Barlow Machy Company

HARTFORD
Huntington Machinery Inc.

HOUSTON
Oliver H. Vis Mach. Co., Inc.

INDIANAPOLIS
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KANSAS CITY
Robinson Machinery Co.

LOS ANGELES
Machinery Sales Co.

MILWAUKEE
Base Machy Machy Company

MINNEAPOLIS
Thos. Machinery Company

PEORIA
John T. Burnett Co.

MONTREAL
F. F. Barlow Machy Co.

NEW ORLEANS
Oliver H. Vis Mach. Co., Inc.

NEW YORK
Huntington & Owen Machy Corporation

PHILADELPHIA
Cohen Machinery Company

PITTSBURGH
Associated Machinery Company

RICHMOND
F. W. Bohlken Machinery Co.

SAN FRANCISCO
G. S. Robbins Machinery Co.

ST. LOUIS
Wm. Bixby Company

SYRACUSE
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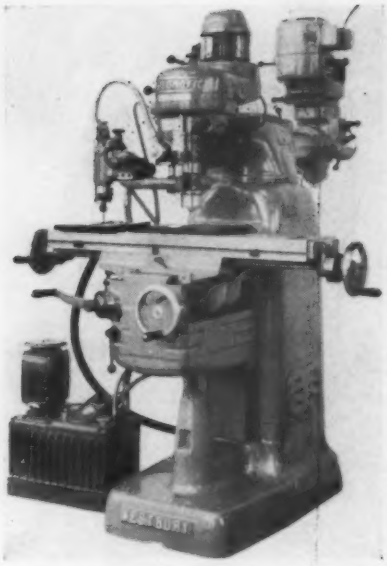
TORONTO, ONT.
F. F. Barlow Machy Company

WORCESTER, ONT.
F. F. Barlow Machy Company



Vertical Turret Mills

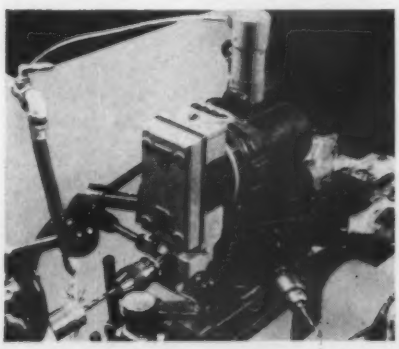
Westbury 1-S has a dovetailed overarm; Westbury 1-R, a round overarm. Machines have all-angle milling head, hardened and ground high-speed ball bearing spindles, and a 5-in. power-fed quill travel with micrometer depth stop.

Three feeds are available: 0.0016, 0.003, and 0.005 ipr. Spindle speeds range from 80 to 2713 rpm; angle setting is accomplished by a precision-control.

Rigidly mounted table is 42¾ by 9-1/16 in. Longitudinal range is 30 in. with 100-in. traverse and 16-in. vertical. The 2200-lb units have a 1½-hp motor-driven head.

Use of a Duplomatic hydraulic tracing attachment converts these mills into fully automatic copying machines with longitudinal and cross power feeds.

Maserati Corp of America, Westbury, NY



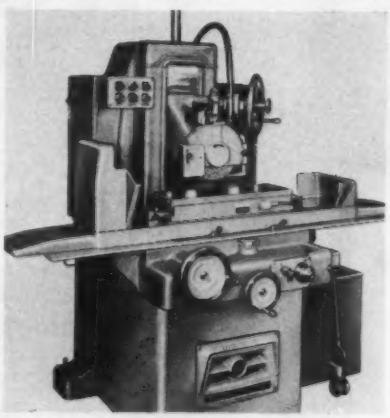
Turret Lathe Device Speeds Small-Hole Drilling

Drill Speeder has been designed for quick small-hole drilling on a turret lathe.

Compact unit contra-rotates the drill, relative to lathe spindle rotation, at a pre-selected rate for cutting at proper surface speed. Feed rate may be increased in approximate proportion to increase of surface speed. In addition to time-saving involved, there is said to be a corresponding increase in quality of finish and accuracy. In many cases, necessity of moving a part to a drillpress for deep-hole work is reportedly unnecessary.

Unit mounts quickly and easily to ram-type turrets. Rotating electrical connector allows turret to index freely. Models are available with V-belt or gear drives; furnished complete with motor, rotating electrical connector, and on-off footswitch wired to connector and motor. Standard motors range from ¼ to ¾-hp, 220v, 3-phase, or 110v, single-phase. Drill capacity may range up to 13/16 in. in tool steel.

Ward-Riddle Co, Ravenna, Ohio



Grand Rapids Hydraulic Feed Grinder Table Speed is 125 fpm

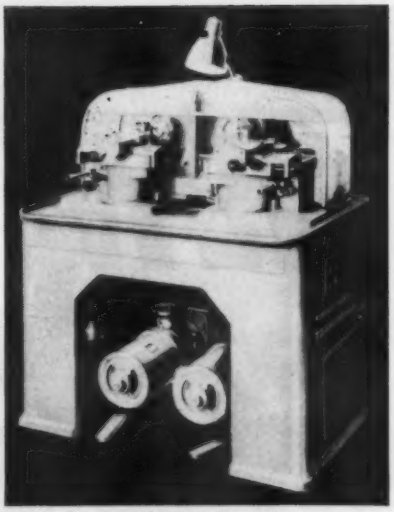
No. 350 hydraulic feed surface grinder has a 8x24-in. working surface with capacity of 12 in. under a 10-in.-dia wheel. Vertical movement is by handwheel on head, graduated in thousandths, and inner handwheel is graduated in tenths of thousandths.

Vickers hydraulic pump and control valve provide longitudinal table speeds from 3 in. to 125 fpm. Hydraulic crossfeed is variable to a maximum of ⅜ in. per table reversal. Spindle is driven through V-belts by a 2-hp motor.

Diamond dressing of the wheel can be accomplished without disturbing the head setting. Guards are on table dogs, and magnetic starters are enclosed to reduce possibility of injury to operator.

Net weight of machine is in excess of 5200 lb.

Gallmeyer & Livingston Co, 346 Straight Ave, Grand Rapids, Mich



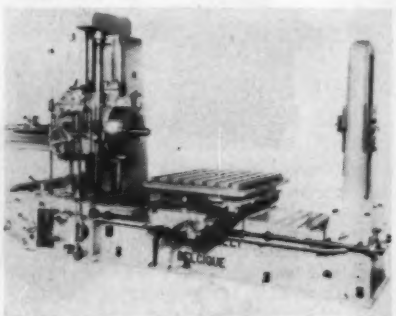
Semi-Automatic Lathe Has Dual Head Arrangement

Kummer type MR 6020 permits turning of intricate forms and fast machining on production runs, according to the distributor. Operator loads work into chuck actuated by pedal and engages the slide motion and spindle drive by depressing the starting handle. Head stops at end of each cycle.

During operation of first head, the operator changes work in the stopped second head. Coordinate cam action aids tool control.

Speeds to 3500 rpm; chuck capacity, 2½ in.; special devices and accessories are available.

Carl Hirschmann Co, Inc, 30 Park Ave, Manhasset, NY



Forges de Gilly Boring Mill

Horizontal boring and milling machine permits simultaneous boring and facing by incorporating a built-in facing head with a power rotary table which reduces setup time. Bed length is 114 in. between face plate and outboard supports. Twenty-four speeds and 54 feeds available. Motor, 20 hp.

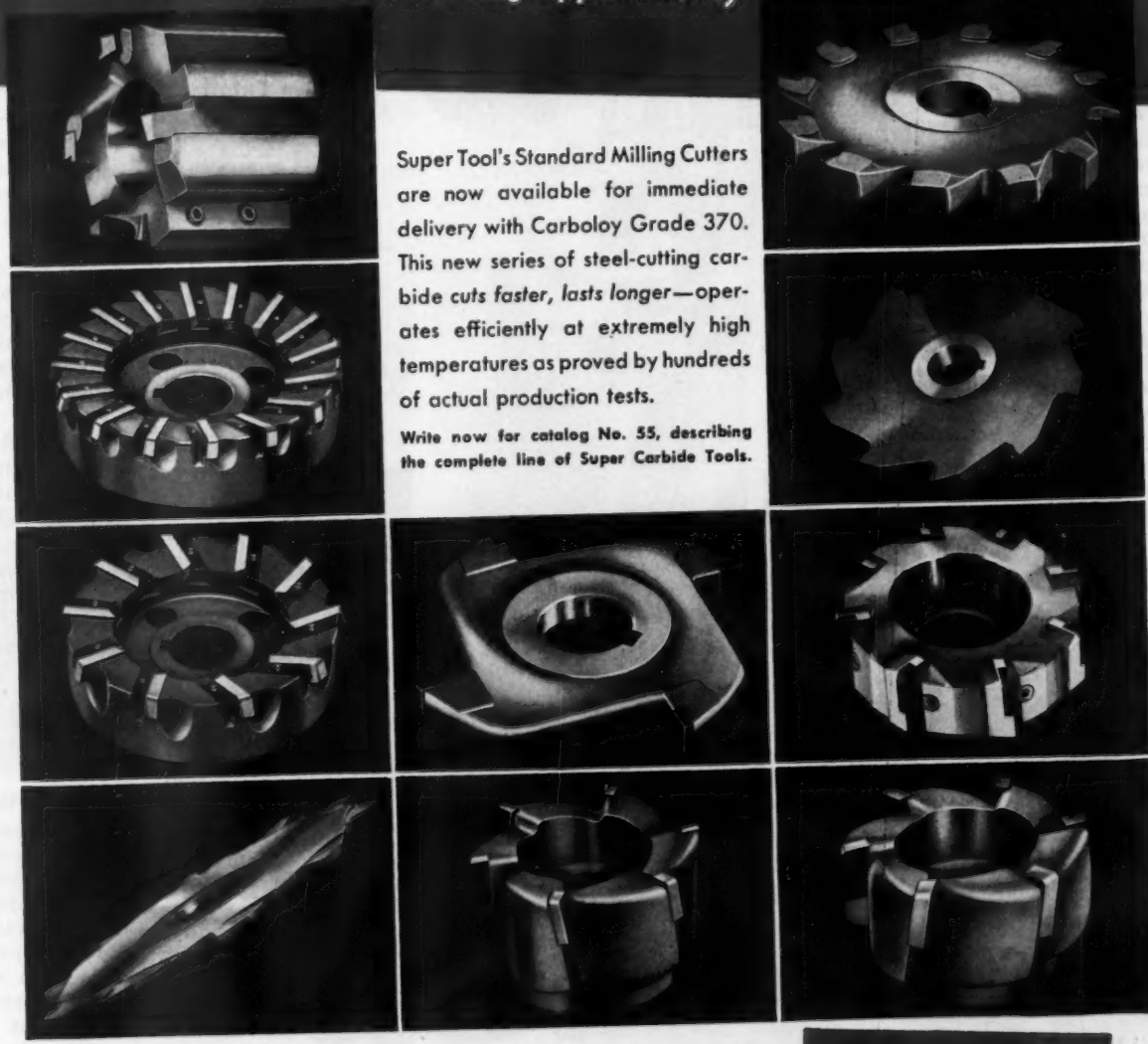
Under new plan, old equipment is removed and shipped to "dollar-short" foreign markets, and replaced with new machines.

Stokvis-Edera & Co, Inc, Port Washington, NY

NEW! NEW! NEW!

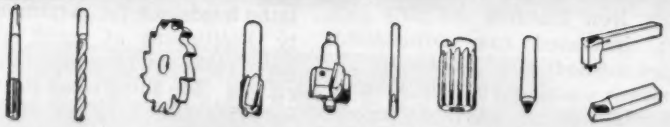
SUPER TOOL STANDARD MILLING CUTTERS NOW IN STOCK WITH CARBOLOY® GRADE 370

(For your steel-cutting applications)



Super Tool's Standard Milling Cutters are now available for immediate delivery with Carboloy Grade 370. This new series of steel-cutting carbide *cuts faster, lasts longer*—operates efficiently at extremely high temperatures as proved by hundreds of actual production tests.

Write now for catalog No. 55, describing the complete line of Super Carbide Tools.



QUALITY CARBIDE TOOLS SINCE 1927

Super TOOL COMPANY

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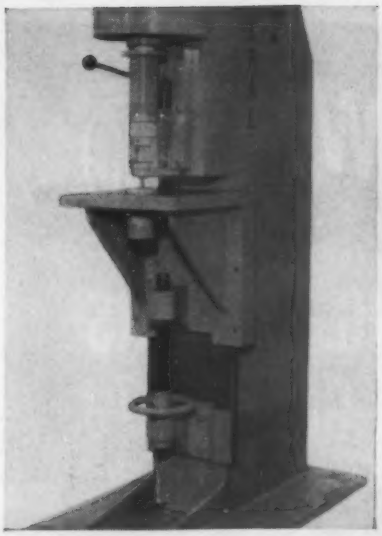


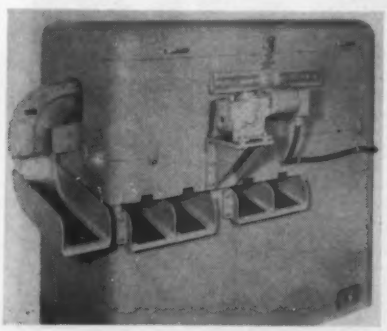
Automatic Bearing Press Has 2-second Cycle

Press has been designed for rapid assembling, sizing, and accurate alignment of self-lubricating bearings in castings or other machined parts, in an automatic 2-second cycle.

Bushing is placed on a sizing arbor on upper ram, work is placed on the table. Depressing the starting lever starts automatic cycle of inserting and sizing the bushing and removing the arbor from it. Loading time is approximately 2-5 seconds.

Tooling, consisting of sizing arbor, stripper, and pilot, is quickly changed for each bushing size. Bushing capacity is ¼-in. to 1¼-in.-dia by 3 in. long. Press stroke is 6 in. with maximum pressure of 2000 lb with air pressure of 90 psi. Table height is adjustable.

General Riveters, Inc, 785 Hertel Ave, Buffalo 7, NY



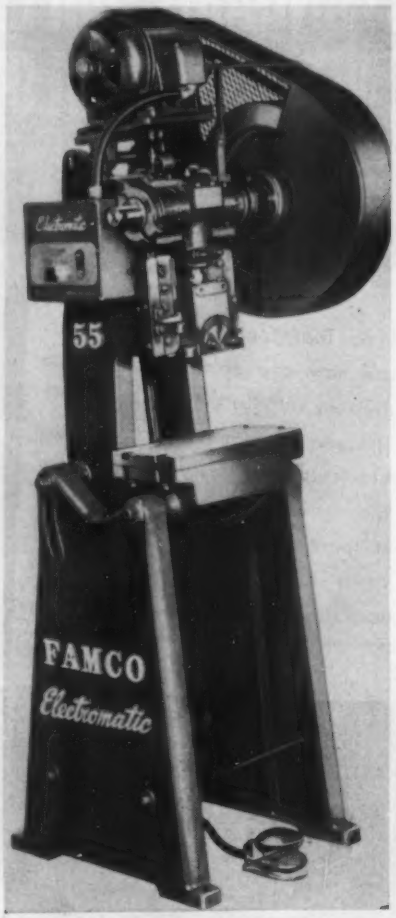
Red Wing Gear Checker Inspects 3 Variables in Shaper-Cut Gears

Automatic motorized gear checker inspects spur or helical gears produced by conventional shaping methods for variables in tooth dimensions, by electronic indicators and master gear for incomplete stroke, oversized and undersized teeth, and thick or thin teeth. Selected chutes acquire the sorted gears, and indicator lights tell the operator the reason for the rejection of any individual part.

Integral helical gears and brake drum parts for an automotive transmission are reported checked in 15 sec.

Machine is 64x31 in., height 4 ft; powered by 1/15-hp motor.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich

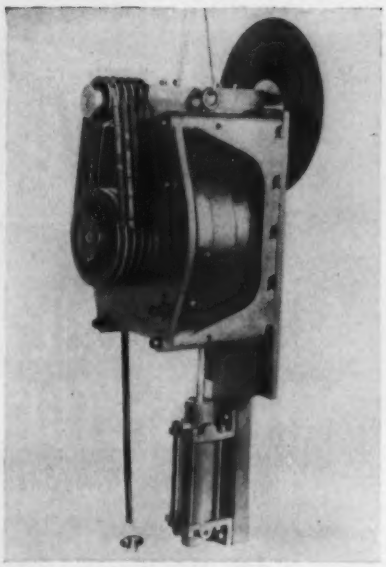


10-ton Power Press Operates at 190 spm

Famco 10-ton standard open-back inclinable power press has a 1¼-in. standard stroke and a 3-in. maximum stroke, provided at extra cost. It operates at 190 spm and has a ¾-hp, 1200-rpm motor.

Two clutch types are available: the Famco "Electromatic" 9-point jaw clutch, or the "Multi-Power" clutch. New features are long ram ways, increased ram adjustment, precision-fitted ram blocks to aid alignment, one-piece crankshaft, semi-steel frame, halved bronze main bearings, and Timken roller bearings on flywheel.

Famco Machine Co, 3100 Sheridan Rd, Kenosha, Wis



Abrasive Cutoff Machine

Bullard abrasive cutoff machine can cut 2½-in.-dia solids, 4-in.-outside-dia tubing, 4-in. angles, or 6-in. channels. It can be used either wet or dry, depending on material being cut.

Axial air-gap motor drives wheel at surface speeds up to 13,500 fpm. This drive furnishes sufficient flywheel effect to minimize slowing down of wheel in cuts, thus preventing burning or scoring of the material.

Photo, above, shows driving mechanism of machine. In operation, the wheel is completely enclosed. Dual clamping plates are used to hold material on both sides of the cut. Wheel travel, plates, and cover are operated by means of double-acting hydraulic cylinders.

Lombard Governor Corp, Ashland, Mass

Vertical Lathe Tools Speed Production

Wesco vertical lathe tools for fast production cutoff and form work are available in two models.

Cutoff tool has an automatic-return slide which holds a standard blade; form tool also incorporates an automatic-return slide holding a ½-in. toolbit. Adjustable stops are provided. Tools, said to be far faster than conventional types, mount on lathe headstock for maximum rigidity. Positioning of cutoff blade assures close working to collet for fast cutting. The third position they provide for turret lathes often eliminates usual second operation.

Wesco Machine Corp, Lathe Tool Div, 7536 San Fernando Rd, Sun Valley, Calif

2nd in a Series...

OF HIGH PRODUCTION CASE HISTORIES

CHECK THIS ONE FOR *SPEED* PLUS *automation*

THE MACHINE: Baird's famous 76H Automatic Chucking Machine.

THE PART: High-compression cast iron rotor hub.

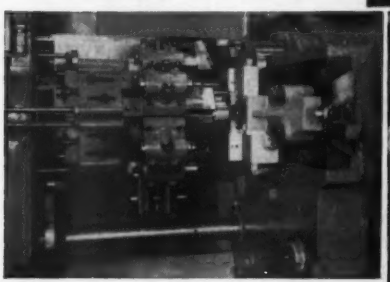
THE AUTOMATION: Automatic loading and unloading in addition to full automatic machining cycle.

THE RESULT: 213 pieces per hour gross. The machine was set up single indexing. Its performance is typical of Baird Machines that are today the backbone of many famous high production lines. If you have a comparable job to do . . .

"Ask BAIRD about it"
Write Dept. A.M.

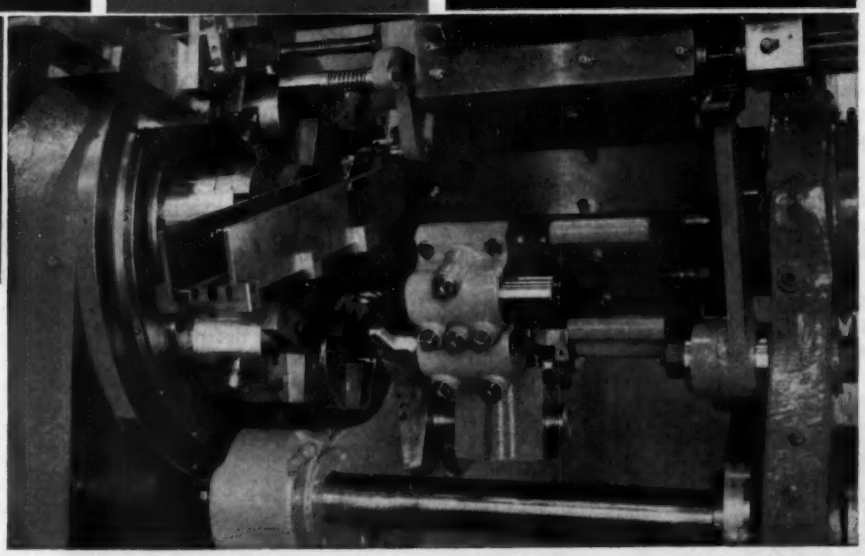
OPERATIONS:

Automatically load. Rough and finish turn O.D. Drill, true bore and ream the small hole concentric with O.D. Face and chamfer end. Chamfer holes. True bore the counterbore. Trepan bottom of counterbore and automatically unload. Illustrations also show rough castings as fed to machine.



(Above) REAR VIEW OF TOOLING

(Right) FRONT VIEW OF TOOLING
Showing load chute at upper left . . . and unload chute at center . . . both at same station.



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ROUND TABLE *Discussion*

SICK LEAVE

Should unused sick leave days be added to a worker's vacation time? What is the best means of handling the problem of the man who takes such leave unnecessarily, and then actually does become ill?

THE COMPANY has just got to face the facts on this problem of sick leave. They can go to one extreme and allow the employees a predetermined number of sick-leave days off per year which they can take, sick or not. They can go to the other extreme and attempt to rigidly control the use of sick leave.

When they take the first approach it becomes very simple for the supervisors; in fact, with such an arrangement it is possible for the employees to tell the supervisor just when they plan to take their sick-leave time off, except of course when they are ill. This is a practical approach and is equitable and fair to all the employees because they all get the same number of days off.

When the organization tries to keep strict control of sick leave, it leads to all sorts of problems. Employees are required to obtain a letter from a doctor as proof that they were ill enough to require medical attention. There are companies that engage visiting nurses to call at the homes of employees to make certain that they are ill and that they remain at home. Most organizations take an attitude somewhere between these two extremes. In general, they do not sanction the employees taking time off if they are not actually

"I don't know why, but I always get a feeling of inferiority when I'm not on the job."

sick. However they realize full well the difficulties attached to rigidly policing such a regulation. Instead, they require compliance with some simple requirements to prevent flagrant abuses. The usual requirement is that the employee telephone his superior or foreman before a certain time each morning when he is out sick.

I have worked in quite a number of shops, both big and small, and I believe that this last method of control is both practical and equitable for both employer and employee.

William Martin
Brooklyn, NY

THE CORRECT interpretation of sick leave by the employees is dependent upon the value they place upon their own conscience.

If a firm establishes a certain amount of time per year, or month, allowable, with pay, to compensate its workers for their loss of time on the job because of some illness, doesn't it seem only right that the worker should accept the arrangement with a certain degree of sincerity? Does it not resolve itself into a question of what constitutes being sick, or can we pin it down to determining just what is right? Then again there are those who don't give a tinker's damn what is right so long as they are getting their share or more, regardless of the loss of the other guy.

We can define the word sickness in pretty lengthy terms covering the physical, mental, psychological and whatnotical. We are all acquainted with the physical irregularities customarily experienced in this life of rat-racing, frustrating speed, and rapid changes in our mode of living. These are all potential contributors leading up to an excuse to take a day off from work. A man can have a headache too severe to permit him from carrying on his work; a pain in the neck (literally), or a score of such irregularities excuse enough in themselves to justify him remaining at home. These in themselves are legitimate excuses.

Taking a day off because a man is worried over some financial difficulty —that is he doesn't feel as though he can carry on his work properly because of so much disturbance to the proper functioning of his mind or, perchance, he has had a hell of a row with his wife because she gave him the cold shoulder the night before, reflects a mental state not conforming to ideal working mastery and should be classified as sickness.

You've brought up a good ques-

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The ideal transparent solution for all grinding operations.
Lusol Shamrock
An excellent combination of cooling and lubrication.
Lusol Unikool
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tion, Al, and it's up to you to find the answer. So far as trying to determine whether a man is sick or just stalling in order to get the day off is heading up a dead-end street. Regardless of how well your system of sick-leave pay is planned, until we reach the point where each and everyone practices the golden rule instead of getting by with anything in order to feather one's nest, no fast and hard rule can iron out the bumps.

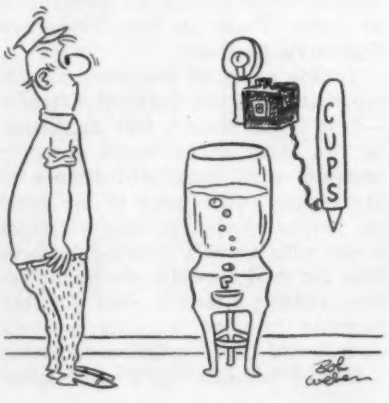
John Homewood
Burbank, Calif

WE CANNOT very well ask for a doctor's note each time a man is out one day. It is quite possible for an employee to stay home one day to shake off a cold. There are some employees who take advantage of sick leave just as they take advantage of other things.

It is a good policy to have employees call in and report the absence the first day. When the employee is absent for three or more days, a doctor's note should be required. Employees should be made aware that any infraction of the rules will result in a less liberal allowance. At the same time we must keep in mind the fact that the employees are allowed five days and they are going to take all that is coming.

The trouble with most sick-leave plans is that the steady employee is not rewarded for his good record. The fellow who is lax and takes the five days gets paid for it. The foremen should keep a record of all lost time both in vacation and sick leave. In so doing they can better control their schedules. It will also make clear who is sincere and who takes advantage. Each man should be required to report the reason for all absence.

There is no perfect way to police



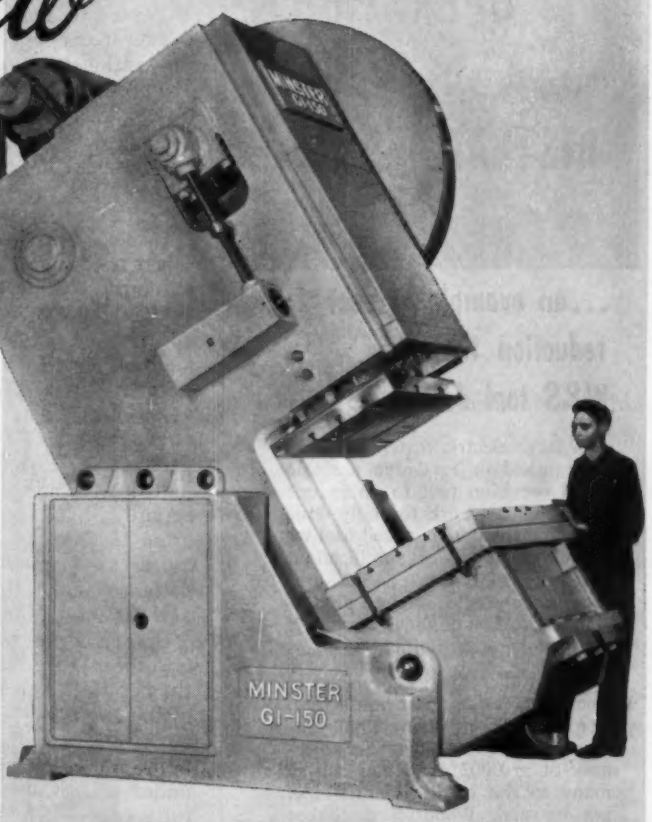
Minster announces a completely New

STEEL FRAME GAP PRESS

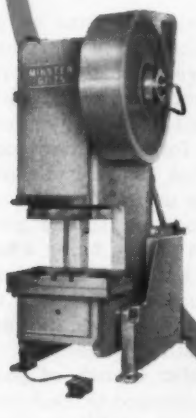
SERIES G1 PRESSES

Patents Pending

Today's most rigid and efficient gap presses—G1 Steel Frames, are engineered and fabricated with a completely new approach to the problem of achieving minimum deflection in steel "C" frames for gap presses.



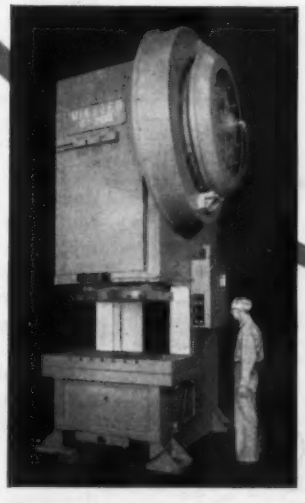
MINSTER G1-150 ton geared type gap press—Motorized Inclining—Cabinet Legs house all electrical and air controls—Connect Air Line and Plug in power; in seconds, it's ready to operate.



CAPACITIES OF
75, 110, 150 and 200 Tons

- Fixed Base or Inclinable
- Flywheel or Geared Types
- Minster Patented Combination Air Friction Clutch and Brake
- Barrel Slide Adjustment and extremely long Slide Ways
- Power Inclining

Series G1-75 flywheel type inclinable gap press with manual inclining and standard leg.



The 200 ton G1 fixed base geared type gap press—Available with either bed attached or sliding type die cushion.

CONDENSED STANDARD SPECIFICATIONS

CAPACITY	STD. STROKE of slide	STROKES per minute	BED AREA	SLIDE AREA
75 tons	4	Flywheel 90 or 120 Geared 40	24 x 36	18 x 24
110 tons	5	Flywheel 80 or 105 Geared 37	27 x 42	21 x 28
150 tons	6	Flywheel 80 or 105 Geared 30	30 x 50	24 x 34
200 tons	8	Geared 28	34 x 58	28 x 36

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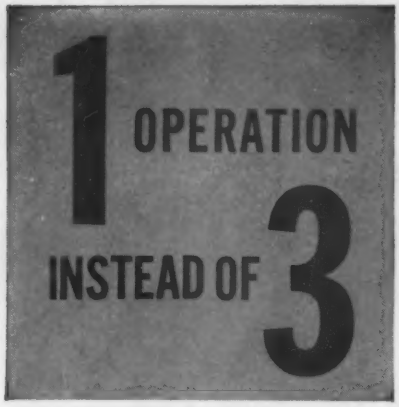

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Woodruff & Stokes specialize in small tool design and manufacture. For example, supplying small cutting tools requiring diameter tolerance of ± .0002" or closer and as many as five cutting diameters is not unusual. Woodruff & Stokes have made these tools their business.

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sick leave, but it can be controlled by keeping careful records. If we find an employee falsely reports sick we cannot be too easy going. He must be told just what is expected of him in regard to sick leave. The steady worker feels he is being penalized. Unless the steady worker is rewarded in some way he is naturally going to take sick leave.

A E Salmons
Philadelphia, Pa

THERE IS NO way to police sick leave without causing hard feelings between labor and management. Use one of progressive management's ace methods to remove the abuses possible in a paid sick-leave plan. Develop job satisfaction among your employees.

Policing is a thankless task in any industrial plant. It gets immediate action without lasting results. A program to develop job satisfaction requires time and considerable effort, patience, and determination, but it gets lasting results.

Employees resent anyone snooping into their personal affairs. Yet, when the personal affairs of employees add to the cost of production, something must be done about existing conditions. Free enterprise is a system under which all costs must be carefully controlled.

The growth, in fact the very survival, of an enterprise, big or small, depends upon control of predetermined costs. Management is jeopardizing the job security of its employees when it tolerates the abuse of a privilege which will increase production costs. Using sick-leave benefits to get free paid vacations is an abuse.

Sometimes employees fail to report for work for no legitimate reason. It may well be that the employee is sick of his job, sick of his boss, or sick of his job associates. Truly, a short vacation, paid for with sick-leave benefits, is a good cure for such ailments. Job satisfaction is an even better cure. It is less costly, and it provides many additional dividends. It is the key to most employee-relations problems.

Job satisfaction, as Mr Burnham Finney editorializes in the March 28, 1955, issue of AMERICAN MACHINIST is obtained by giving the employee a feeling of belonging, personal recognition, a sense of security. William C Menninger, MD, a psychiatrist, points out that industrial workers are not satisfied merely with the chance to earn a living. They want the opportunity to build a life.

Show me an industrial plant where an employee feels that he is needed, where he is called by name when contacted by any member of management, where he feels reasonably sure of his job. I'll show you a plant where the paid sick-leave privilege is not abused, where there is loyalty, cooperation, and a determination to be competitive.

Peter A Seward
Swampscott, Mass

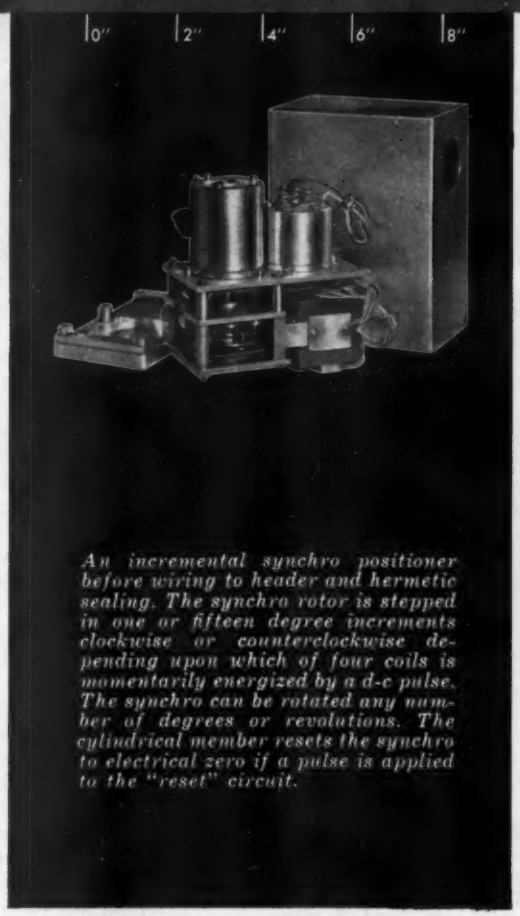
HAVING BEEN around machine shops in the New England area for quite a while, I have yet to hear of a privately owned shop handing out sick leave to the rank and file—unless there was some form of union contract involved. But I have had some experience of the uses and abuses of sick leave in working for the government. Human nature being what it is, there is always some individual who feels it incumbent upon him to use up his sick leave despite the fact that he is disgustingly healthy.

In the particular branch of government I once belonged to, each employee was entitled to fifteen days sick leave in the calendar year, along with a similar amount of regular leave. When the regular leave was used up I can tell you that fifteen days of sick leave looked mighty tempting. When you add to this the fact that sick leave meant just that and could not be allowed to accumulate as in the case of regular leave from year to year, a certain few, who are always present in every shop, made it their business to see that fifteen days' pay for doing nothing did not revert to the government treasury. "Colds" were frequent at regular intervals and certain individuals became peculiarly susceptible to them. At certain seasons of the year—when the fish were biting

"Looks like materials handling found another short cut!"

built to do just one servo control job . . .

perfectly



An incremental synchro positioner before wiring to header and hermetic sealing. The synchro rotor is stepped in one or fifteen degree increments clockwise or counterclockwise depending upon which of four coils is momentarily energized by a d-c pulse. The synchro can be rotated any number of degrees or revolutions. The cylindrical member resets the synchro to electrical zero if a pulse is applied to the "reset" circuit.

Like all Transicoil servo assemblies, this incremental positioner "does the job right" because it was designed for a single application . . . by a company whose major function is to provide complete servo assemblies precisely engineered and manufactured to solve individual servo control problems.

Of course, if you merely want servo *components*, you'll find Transicoil's control motors, motor-gear train combinations, motor-gear train-generator combinations, and servo amplifiers built to the highest order of precision and accuracy. But it is in the "package" engineering of unique assemblies that Transicoil's experience and creative imagination offer the greatest value. And in most cases, these assemblies cost no more than the individual components would purchased separately.

That's why it pays to check your servo problems out with Transicoil first. Write outlining your problem, and ask for Transicoil's new gear-motor bulletin. You'll find it a mighty handy availability guide in designing for tight production schedules.

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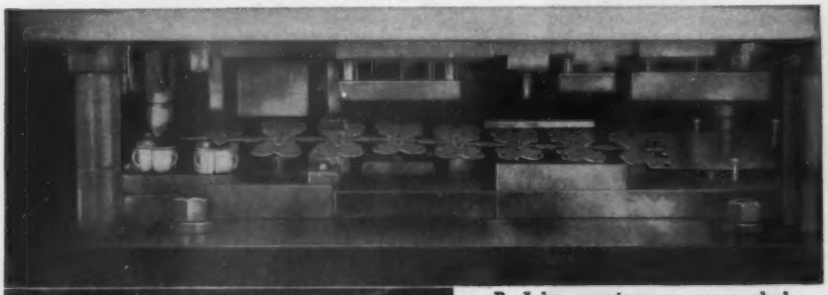
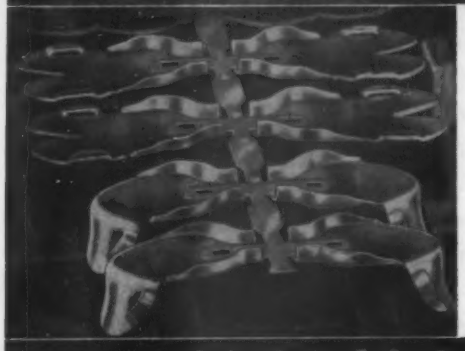
True Automation — piercing . . . forming . . . swaging . . . coining . . . blanking . . . and trimming — with no intermediate steps or inspection — is possible in one press operation with B. Jahn progressive dies. From raw material to finished piece, B. Jahn dies perform precisely, uniformly — cutting unit time and unit cost with every press stroke. Every B. Jahn die is skillfully engineered and built to afford progressive production in one operation — then "production proved" by actual use in the customer's equipment to guarantee that every benefit of Automation is inherent in the die — and that it meets every specified requirement of performance and satisfaction.

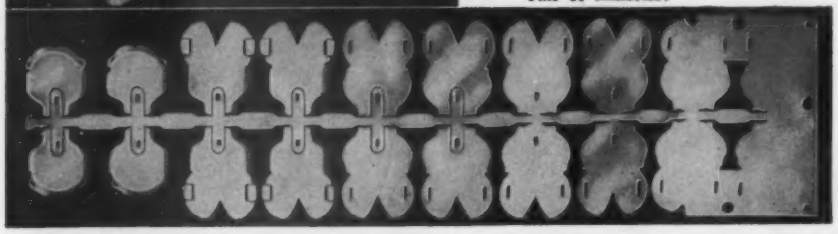
THIS OUTSTANDING EXAMPLE PROVES THAT B. JAHN PROGRESSIVE DIES AFFORD REAL AUTOMATION!





B. Jahn engineers were challenged to deliver a progressive die that would stand up and retain tolerances under the terrific forming shock required to make heel plates for roller skates from tough 17 gauge steel.

B. Jahn devised and built a 10 station progressive die that met every stringent forming and drawing requirement — operated at 70 strokes per minute — delivered 2 pieces per stroke — on a production run of millions!



Send today for the fact-filled "Story of B. Jahn Dies".

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

or a crucial ball game was on tap—the plant switchboard was kept busy in the morning handling the sick calls.

Then someone conceived the bright idea of limiting the sick calls to two per month per employee, with an absence over three days requiring a doctor's certificate. This reduced the "sick" load considerably, except for the die-hards who could always find a doctor in town who would sign a certificate at the drop of a fee. Then war came along and sterner measures were required to curb absenteeism. Certain individuals were hired by the personnel department to investigate every sick call and report their findings. Which meant that if an employee was reported sick and was absent from home when the investigator called he or she had to have a mighty good excuse.

Of course, I am not suggesting that Al have his company go to extremes in protecting the five-day sick-leave period from abuse. Frankly, I believe the percentage who abuse this privilege are certainly not the backbone of any company, and form a very small minority indeed. I don't blame Al for being irritated, however, when he overhears an employee sounding off about abusing the sick-leave privilege—in my opinion a private bawling-out is in order.

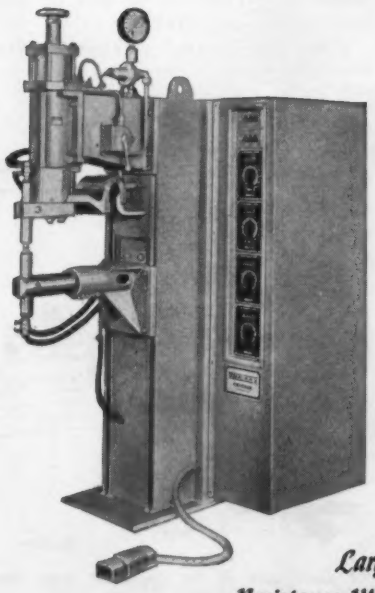
Where the private company is concerned, if they feel that the sick-leave privilege is being abused they can always withdraw it. Unfortunately, this penalizes the majority of the workers for shortcomings of the minority, and at the same time does not contribute to good employee-company relations.

To sum up, we have to realize, with human nature what it is, no privilege on earth can be one hun-

"What's all this nonsense about you operating a sideline here in the plant, Blakley?"

FOR THE FIRST TIME A COMPLETELY NEW DESIGN OF SMALL, LOW PRICE SCIAKY WELDERS

Featuring all the Ruggedness, Dependability and Consistency of Operation Common to Sciaky Basic Thinking—Welders Designed to Do More Useful Work at Lower Operating Cost with Maximum Reliability!



SP-1 AIR OPERATED, PRESS TYPE, LOW IMPEDANCE, SINGLE PHASE SPOT WELDER

Through advanced design, mass production tooling, and complete use of integrated parts, Sciaky is introducing a complete new line of competitively priced, small, standard spot and projection welders. Check these important design features . . .

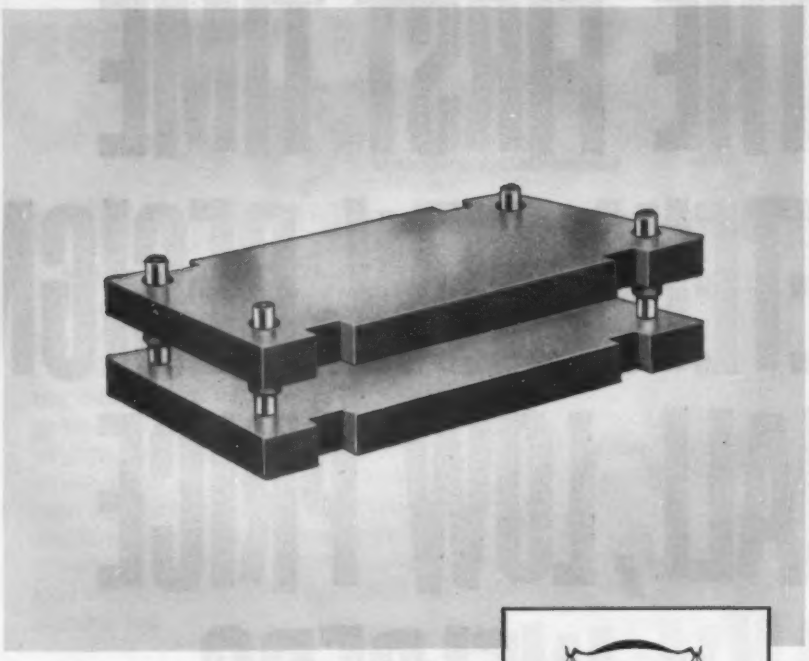
Pneumatic Double-Acting Cylinder Head
Recirculating Ball Bearing System Guided Ram
Side Mounted Sciaky Integral Control
Low Impedance Secondary Circuit
Sciaky High Efficiency Welding Transformer
Fabricated Frame with Heavy Vertical "T" Slotted Columns
Solid Copper Alloy Lower Arm
Silver-Plated, Laminated Flexible Shunt Conductor

For complete details and specifications on the SP 1 spotwelder, or EP 1 projection welder, write for Bulletin 324-2.

Largest Manufacturers of Electric Resistance Welding Machines in the World

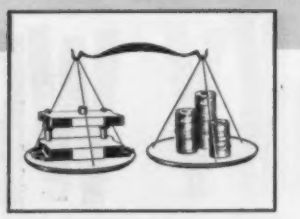
SCIAKY

SCIAKY BROS., INC. • 4933 W. 67th STREET • CHICAGO 38, ILLINOIS



FASTER DELIVERY *on Both* SPECIAL and STOCK DIE SETS

Now . . . you can get into production faster with a Detroit special or standard die set. *First,* because of our greatly expanded facilities, we are now making delivery in less time. For instance, a standard die set will be shipped within 24 hours; specials in remarkably short time. *Second,* because every *full-value* Detroit die set is built up to our high standard and not down to a price and is factory-tested to specifications. Such precision gives you faster mounting without the delay and cost of reworking the set in your shop. Why not talk things over with our nearby representative? Write today.



"full value"

means that in a special or standard Detroit die set you get what you pay for . . . the exact, specified thickness of both die holder and punch holder, true parallelism of surfaces, precision fit of pins and bushings — all assured by precision manufacture, factory assembly and factory inspection.

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PRECISION-BUILT ACCESSORIES

In stock for immediate delivery is an extensive range of die-makers' accessories, including the new self-oiling guide pin bushings.

Detroit DIE SET CORPORATION

2895 W. GRAND BOULEVARD • DETROIT 2, MICHIGAN

Offices in Principal Industrial Centers

dred per cent free of abuse, and govern ourselves accordingly. In Al's case I would schedule my work around individuals who have proven themselves dependable and leave the less pressing jobs for the ones who are less likely to be on hand, judging by past performance.

Robert S Alexander
Glastonbury, Conn

SINCE OUR many social benefits have come into being in our industrial world we have created many new problems. The sick leave is a wonderful step forward in social reform making it possible for a worker to be sick and yet collect his pay while out of work. Those who thought up the idea were working to make the laborer become one of a "better class of people." However, along with this idea there was no counterpart or control developed for application of the new reform.

Naturally this sick-leave idea caught on. Why wouldn't it? Here was a new way to raise the level of the ordinary worker at the expense of the business man. Further, it did have some real merit if properly administered for the industrialist. No one worried about many problems arising from it, much less the avid promoter of the idea. So sick leave was born.

Now there are many who like to get something for nothing—who like to beat the company, and who believe that the world owes them a living. Fortunately this is not the majority group in any instance, but it is a group large enough to create problems. Suddenly a wonderplan of giving a man five days each year with pay in which he can be sick backfired. . . . why?

Who can control sickness? Why

"I don't care if the capitalist dogs have coffee breaks in their machine shops . . . there will be no 'Vodka Breaks' here!"

there's a NEW one to look at . . .

If you think you've seen everything in milling machines, we suggest you take another look. The Axelson Milling Machine is something new. Axelson has been building lathes since 1915, and now the precision and rugged strength for which Axelson Lathes have long been famous are to be found in milling machines, too. Engineered and built by an organization which has been serving the machine shops of America for over 40 years, these new mills are in every way worthy to bear the Axelson name. Send for bulletins which will show you why you can't afford to overlook Axelson if you're in the market for a milling machine.

AXELSON

AXELSON

MILLING MACHINES

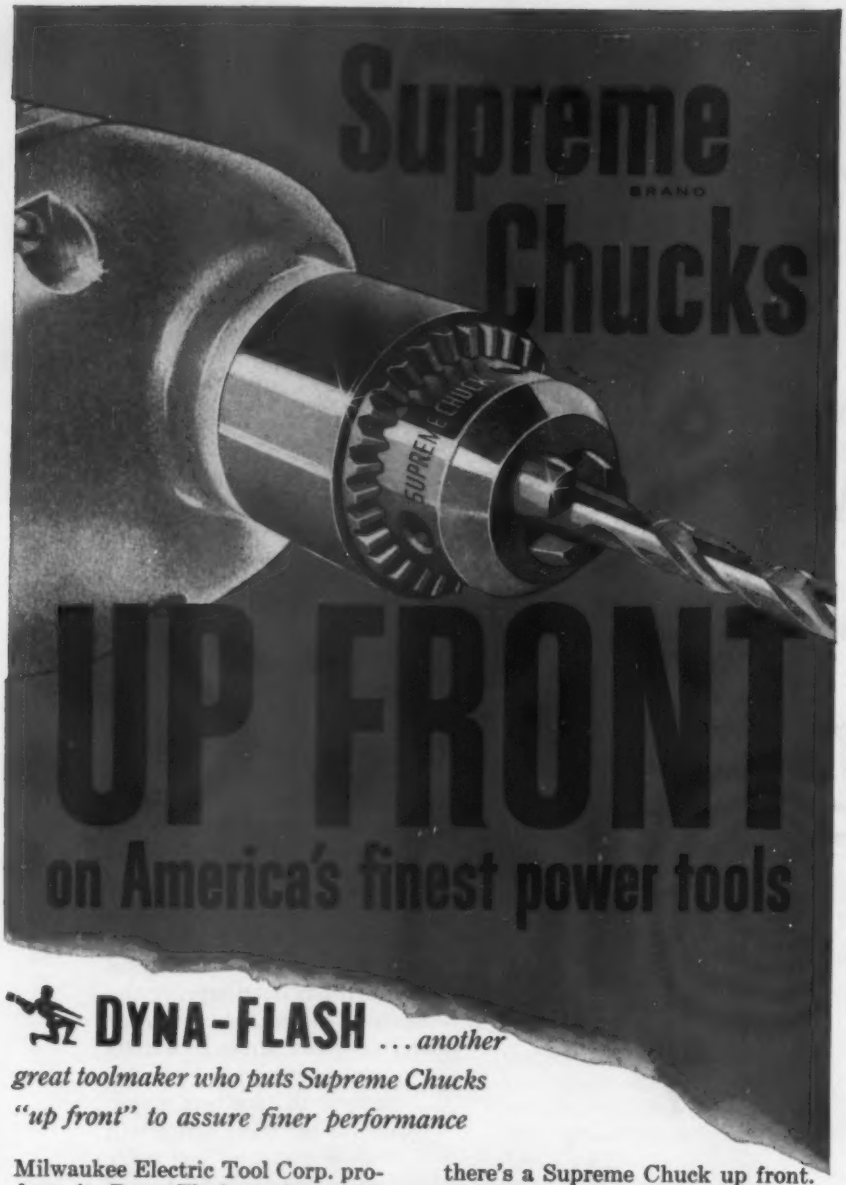
make man hours mean more

Producers of the World famous Axelson Lathe

AXELSON MANUFACTURING COMPANY

DIVISION OF U. S. INDUSTRIES, INC.

6160 S. BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA • Dealers in Principal Tool Centers of the U. S.



DYNA-FLASH ... *another great toolmaker who puts Supreme Chucks "up front" to assure finer performance*

Milwaukee Electric Tool Corp. produces its Dyna-Flash products with the sincere intention of giving America's tool buyers the finest performance qualities possible.

Milwaukee Electric Tools, like other power tool makers, have found that they have a finer product to sell in Dyna-Flash drills when there's a Supreme Chuck up front. Tool buyers everywhere will do well to follow the leaders and specify Supreme Chucks on new tools—insist on them for all replacement use.

An industrial distributor near you can give you the full story on extra quality Supreme Brand Chucks.

SUPREME PRODUCTS, INC. • 2222 S. CALUMET AVE., CHICAGO 16, ILL.

five days? What happens if the man were not sick? Many questions arose and many were invented and asked—the more talk—the more many people began to feel they were getting gypped each year out of five days' pay.

So the more bold began to scheme up a way to beat the idea. Why not just stay home and collect the money without being sick? They tried it, and sure enough—because no check was made—the stunt worked. Who was to blame; both parties, but perhaps mostly the company, because they did not set up a control on this new idea. They knew that men would take advantage of anything proposed. It is human nature to some, and it is not confined to the lower working class.

So, as in all things, the constant beating of the plan caused it to become more and more just a way to get five extra days without work. Now, eventually the idea got so bad that even the Civil Service had to place controls on the working of the idea. When this happens—things really are bad.

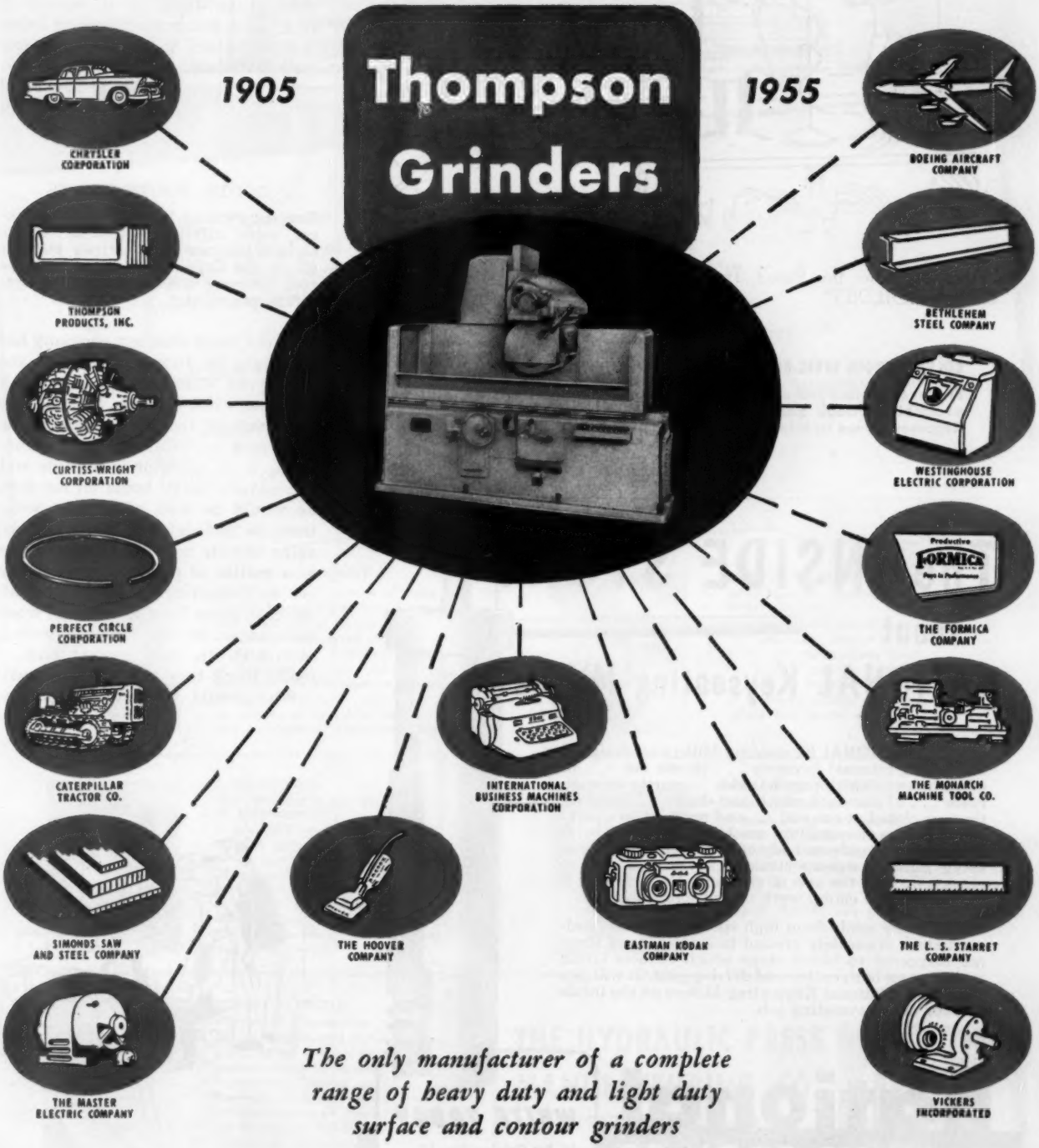
The easiest control was to require a doctor's statement of sickness. This reduced the stay-out to a minimum. Now either those who take advantage of the plan are sick, or they have an "in" with some doctor who is willing to sign a statement for a cut. Again, fortunately these individuals are few and far between.

As in all laws nothing can be established to run wild without some curbs placed upon it. Sometimes these curbs are actually hardships on some pepple. Let's think for a moment. Why should a person legitimately sick with a cold have to pay a doctor to sign a statement that he

"No, I haven't met quota . . . what's he look like?"

Quality Speaks

among the thousands of users of



The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders

THE THOMPSON GRINDER COMPANY, SPRINGFIELD, OHIO

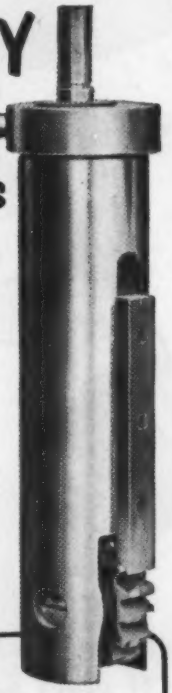
"And remember this Pete? The first die you ever made for us with Columbia OILDIE!"

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

The INSIDE STORY about NATIONAL Keyseating Millers



NATIONAL Keyseating Millers are designed for milling internal keyseats . . . in one cut . . . in offset holes . . . with parallel sides . . . partly through holes . . . of standard width and depth . . . in holes that are closed at one end . . . and many other operations that a keyseating machine can't reach. A demountable guide on body of Miller enters keyseat being milled assuring straight keyseat in perfect alignment with the axis of the bore, thus making it unnecessary to clamp work to drill press table.

CUTTERS are made from high speed Rockwell hardened steel, accurately ground to size. Tops of teeth are staggered to break chips which reduces strain and wear on both cutter and driving pins. It will pay you to put National Keyseating Millers on the inside of your next keyseating job.

national
MACHINE TOOL CO.
CINCINNATI 22, OHIO

WRITE TODAY
for Catalog No. 17
complete, handy size

was ill and had to stay nome? We see now that the plan to help the lower class actually benefits the doctors—for their house-call fees are such that it really absorbs a good portion of the worker's pay for the day out.

Actually we should spend more time in working out details of social reforms and less time in dreaming up new ones. If your sick-leave plan is not being abused by a great many, then don't try to control it. If a large group start staying home just to collect, then require a doctor's statement of illiness.

Charles D Townsend
West Hartford, Conn

BOOTS, BOOTS, BOOTS

Can a company insist that all workers wear safety equipment? If so, should the company defray part or all of the expense? How would the cost compare with accident-compensation payments?

I HARDLY think that any company has the right to dictate to any of the employees what they shall or shall not wear when at work. That savors too much of the police state to be welcomed by freedom loving democrats. If an operator is sensible and can endure heavy boots on his feet, he would be well advised to wear them in self defence. I cannot imagine anyone *wanting* to wear them as a matter of personal pride. They are so disgustingly ugly to look at. At least, those I see are the last word in ugliness. Horror footwear with a capital H. In their present form, I really think they should be banned.

Why should so many things con-

"Gee, Al, we sure miss you down at the plant, clowning around your machine with the safety guard off."

A special report on

PROGRESS AT H-P-M

To Our Customers and Friends

1. H-P-M is now pledged to a series of broad, new policy decisions designed to strengthen our sales, service and manufacturing program. The growing demand for hydraulic equipment increases our responsibilities to the industry.
2. H-P-M will carry out this program as an independent company.
3. Significant developments are in the making for the months ahead. They will be announced within the next few months.
4. Key executives have been selected to play important roles in this new program. Their combined experience with H-P-M in the hydraulic field will accelerate the fulfillment of our plans and strengthen our position.

WILLIAM H. BENNETT
Vice President in Charge of Sales
A well-known H-P-M personality and graduate of University of Cincinnati, has served H-P-M as engineer, Sales Engineer, Director of Engineering, Sales Manager and now Vice President in Charge of Sales. Extensive experience in all phases of hydraulic design and application. Professional Engineer.

GLEN R. PITTMAN
Sales Manager, Hydraulic Power Division
Has successfully served in engineering capacities with H-P-M since 1938. Left the company briefly for another position and returns to head up Power Division sales of hydraulic pumps, cylinders, valves and power systems.

J. W. ARNOLD
Vice President in Charge of Manufacturing
A graduate of General Motors Institute with successful manufacturing and engineering experience in companies such as Cadillac, Ford, Clark Equipment Co., United Stove, and Erie Engine and Manufacturing Co. He brings to H-P-M a wealth of manufacturing managerial talent.

WILLIAM N. WOODWARD
Secretary-Treasurer
A graduate of Ohio State, has served the company since 1946 in the accounting department, as controller and assistant secretary. His promotion to Secretary-Treasurer is an important step in H-P-M's new program.

ROBERT J. LINDSEY
Director of Engineering
Another experienced H-P-M engineer promoted up through the ranks from engineer to Director of Engineering. Served as Chief Engineer of Elmes Engineering Division, American Steel Foundries. He returns to H-P-M now as Director of Engineering.

THE HYDRAULIC PRESS MANUFACTURING CO.
1002 Marion Road
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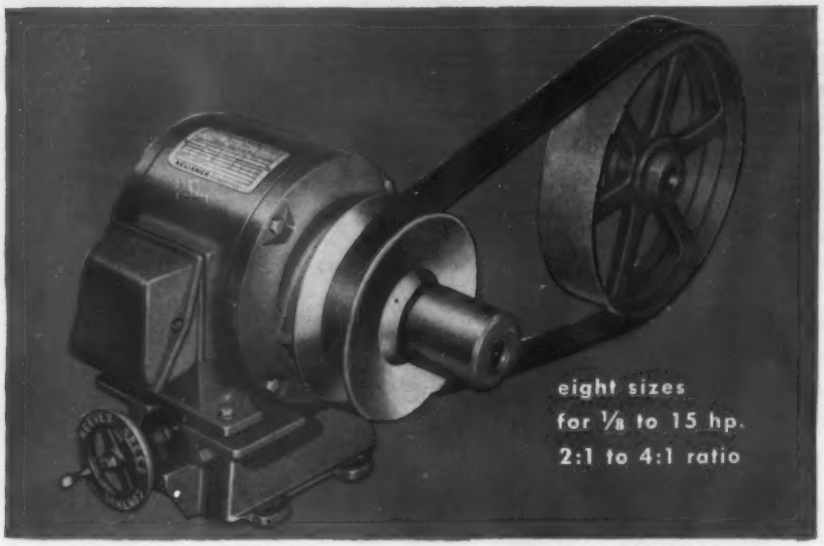
HPM

Now—all from one source

- VARI-SPEED MOTOR PULLEY
- ADJUSTABLE MOTOR BASE
- VARI-SPEED BELT
- RELIANCE Ac MOTOR
- DRIVEN PULLEY

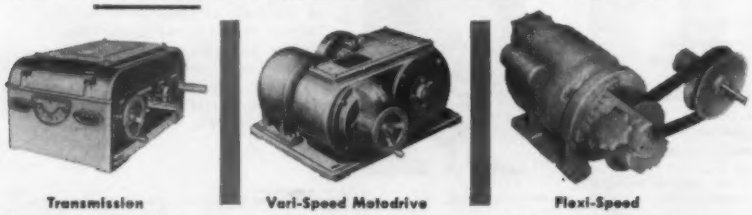


REEVES

Vari-Speed Motor Pulley

This simple, compact REEVES unit provides an economical way to widen machine range, and an efficient method of adjusting work flow to changing conditions. Speed variations are effected smoothly and instantly—without stopping the machine! Unit also available without motor. For bulletin complete with rating charts and dimensions, write Department A18-V545.

THE RIGHT SPEED FOR EVERY NEED!



Transmission
Heavy duty—2:1 to 16:1 range—fractional hp. to 87 hp.

Vari-Speed Motodrive
Compact—2:1 to 6:1 range—sizes to 40 hp.—fractional with 10:1.

Flexi-Speed
Versatile, economical—8:1 range—½, ¾ and 1 hp.

The wide range of REEVES variable speed equipment is now supplemented by the line of Reliance drives. Now—more than ever—you can rely on your REEVES representative for the answer to any speed control problem.

REEVES PULLEY COMPANY, COLUMBUS, INDIANA
Division of **RELIANCE** *Electric and Engineering Co.*

nected with safety be so crude in appearance? In this matter of safety appliances there is ample scope for imaginative design. Take goggles as another example. Could anything look more hideous on the human face than a pair of goggles of standard design? Then look at a man returning to his machine after having had a finger dressed to protect a superficial cut from possible sepsis. The finger plus bandage looks twice its normal size. Is it to be wondered at that the men prefer to give the finger a good wash, lay a tobacco leaf on the cut and contain the 'ot with a coating of chewing gum, rather than go to the ambulance room, to return manipulative on only one hand, all because of a mere scratch?

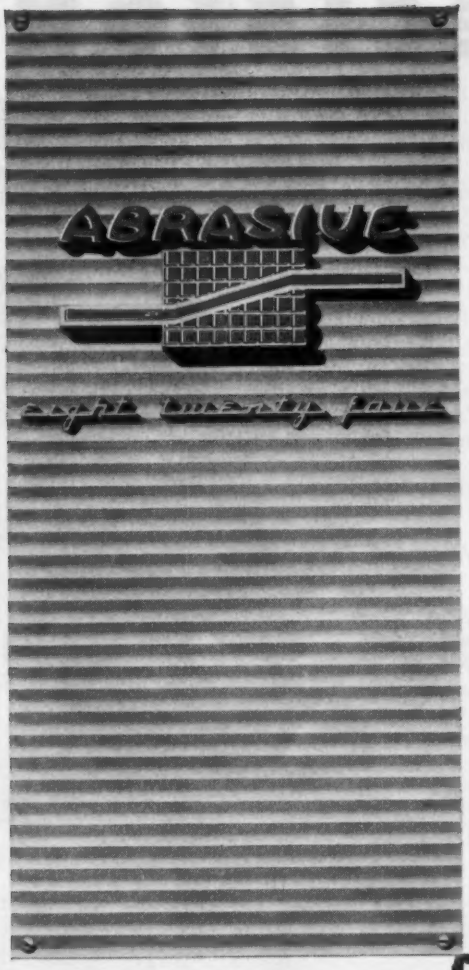
This lack of comfort, appearance and good taste in safety matters arouses the hostility of many of the men, makes them shun the safety boots, abhor the safety goggles and shy clear of the ambulance room when injury is slight.

If a company makes wearing of safety boots a condition of employment, I feel it should be willing to foot the bill. After all, the boots could be returned to the crib at the end of a shift, like a welder's face shield, or the machinists' goggles, and remain company property. I doubt if any company could compel a man to wear safety boots and make him pay for them too. That would be adding insult to injury. On the other hand, if the company made a free issue of the boots to the hostile element, to induce them to "fall in," they could hardly make the faithful stump up. That would be bad psychology and shop atmosphere would suffer.

Ed makes an incisive point when he claims "It's a matter of eco-

(Continued on page 228)

"It may be just a coincidence, but I moved the water cooler into my office, production has jumped 15%."



You are going to see new things from ABRASIVE

The new Abrasive name plate above gives you a hint! In 1956, our fortieth anniversary, Abrasive will introduce a number of important developments in their well known line of surface grinders. For your greatest production year, keep your eye on Abrasive pioneering in 1956.

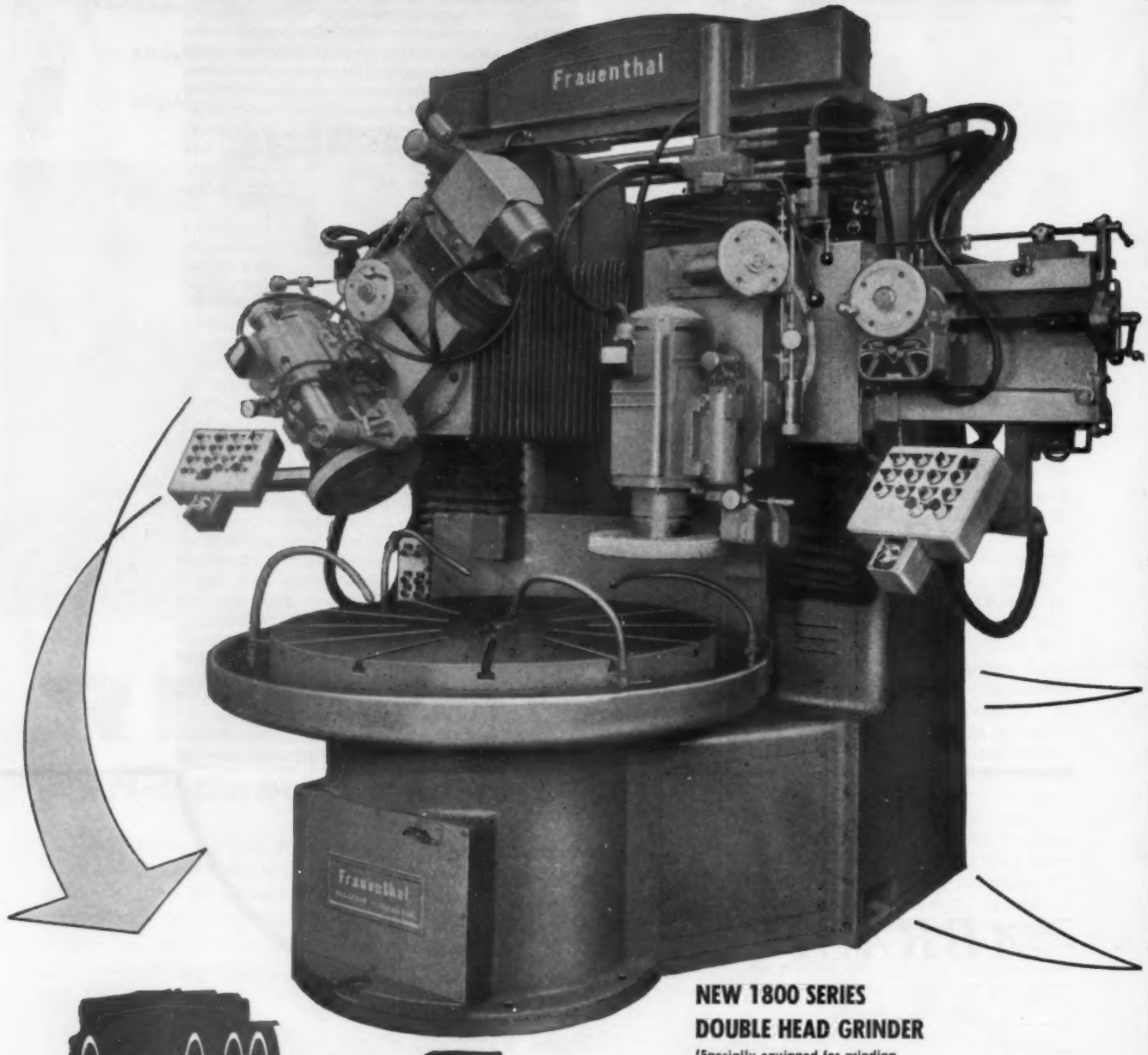
ABRASIVE

Machine Tool Company

Dexter Road, East Providence, Rhode Island

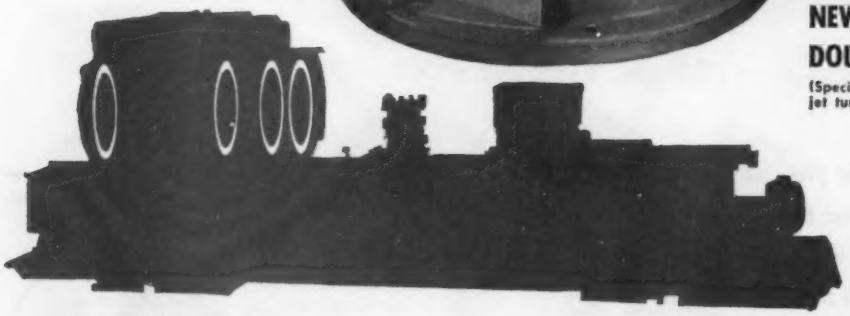
Sorry! We can't show this revolutionary new Abrasive in detail. Look for it in 1956.

PRECISION-GROUND



NEW 1800 SERIES
DOUBLE HEAD GRINDER

(Specially equipped for grinding jet turbine blades)



MACHINE TOOLS

Free Catalog!

For complete details on Frauenthal 1800 Series Double Head Grinders, write for catalog.

Frauenthal Division

COMPONENTS . . .

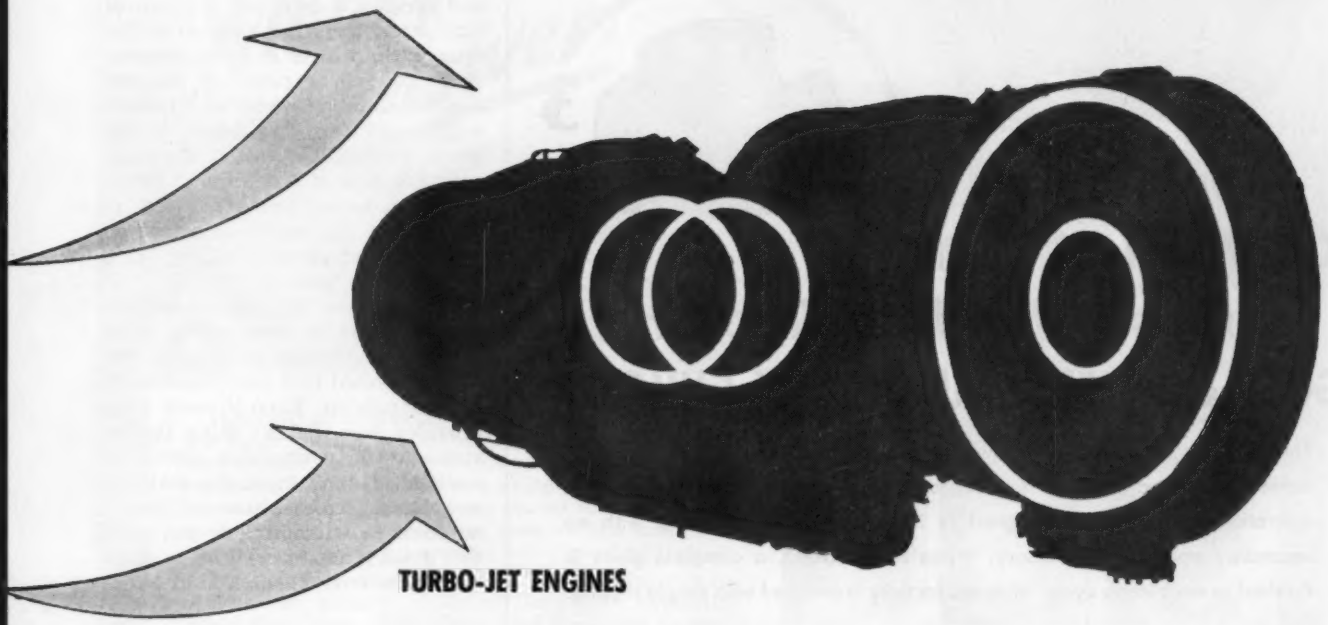
ORDNANCE

WHATEVER YOUR FIELD OF INDUSTRY — With Frauenthal precision machines, you're able to grind diameters and related surfaces without changing setup of the workpiece and obtain accuracies within .000200". This assures consistently uniform precision in concentricity, parallelism and roundness.

The accuracy and versatility of Frauenthal equipment is unequalled in the machine tool field. Difficult work-pieces — those impossible to handle on conventional horizontal grinding equipment — are handled with comparative ease on these unusual machines.

Four different series of machines are available affording table sizes up to 140". The 1800 Series Double Head Precision grinder, illustrated at left, is now available with a maximum swing of 72" and various table sizes to suit customer specifications.

For complete details, contact Frauenthal of Muskegon, Michigan.



TURBO-JET ENGINES

MACHINE TOOLS — Modern day machine tools are required to produce piece parts to greater accuracy than ever before. Therefore, machine tool components must be more precise to the nth degree. With Frauenthal grinders you can grind collets, chucks, spindle sleeves and similar components under simulated assembly conditions to assure concentricity, parallelism and roundness. Eliminate costly and time consuming hand scraping and grind plated parts prior to and after plating for increased wearability.

TURBO-JET ENGINES — Diffuser cases, rotors, compressor discs, vanes, etc., are components of jet engines ground on Frauenthal equipment. Thin section parts, which are unstable due to their design, are ground on the horizontal rotary table of the 1800 and 3100 Series machines. The compound and spindle angle setting features permit the grinding of surfaces normally inaccessible on conventional equipment.

ORDNANCE — Large bearings and housing components for ordnance applications are ground on the 1800 and 2200 Series grinders. Applications vary from aircraft gun turret bearings to the large turret bearings required for tanks, motorized gun carriages, radar and naval gun mounts.

THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN

More Pieces COMPLETELY *finished in less time on* GOSS & DeLEEUW AUTOMATIC CHUCKERS

This machine . . . already acknowledged and accepted as a metal-working achievement, and the only standard one of its kind . . . winds up a day's operation with all parts assigned to it completely finished and with no secondary operations necessary. When fully loaded, a complete piece is finished at each index cycle. High productivity is attained with simple tooling.

The "1-2-3" exclusive Goss & DeLeeuw feature provides for finish machining three ends of a part simultaneously or in sequence. All operations are performed in a single set-up, and complete finishing done in much shorter time than by conventional methods.

●

Send for illustrated literature which fully describes this recent Goss & DeLeeuw development in chuckers. Submit samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY PRODUCT QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

nomics." The factory has always been the "eventide home" of the workers' shoes. Chaste, new shoes ultimately spend the twilight of their days in the factory. When they reach that stage, they become comfortable old friends with whom the tenderest of feet never fall out. Granted, they are no protection against foot injury, which nobody wants, but they are a solace to tired, aching feet which nearly every factory worker has, towards the end of a shift on a hot summer afternoon. The ugliness and weight of standard safety cap boots apart, no person with tender feet, bunions, corns, etc, should be asked to wear them.

Painful, aching feet are a prolific cause of underproduction, rejects, and even accidents. They impair the worker's concentration on the goal of high production, high accuracy and personal safety; and if a pair of old "surds" give foot-comfort to the wearer, the wearer and the company stand to gain because of the undivided attention which an operator, with happy feet, can devote to the job on hand. The operator, of course, runs the risk of foot injury; but if he enjoys happy feet and is free to concentrate his whole attention on his work and personal safety, it's a good risk, to boot.

I should say *all* individuals can rightly refuse to wear safety boots if they feel strongly about it. To my mind, it would be a great mistake to use compulsion. Even if boots were provided free, I don't think the instrument of compulsion could be justified. I don't think the management has a good case here and there's no point in attempting to put one's foot down if one hasn't a leg to stand on. Those innovations should be in-

"Well I'll be doggone . . . Hardluck Sam's gone a whole month without an accident . . . The company is so greteful they're giving him a bonus check!"

For Ferrous or Non-Ferrous Cutting SIMONDS has a Money-Saving Answer!

It pays to pick the best blade for every cutting job. You get faster cutting, longer blade life and maximum saw performance, with fewer shutdowns for resharpening or replacement. Whether you're working with ferrous or non-ferrous metals, Simonds is one source that offers you a complete line of job-designed saws — the most wear-resistant, edge-holding saws for any type of cutting.

For non-ferrous cutting, Simonds offers you a choice of four basic types — Si-Maloy* Steel Saws, Semi-High Speed Steel Saws, High Speed Steel Saws, and Carbide-Tipped Saws — plus Inserted Tooth and Segmental design Saws.

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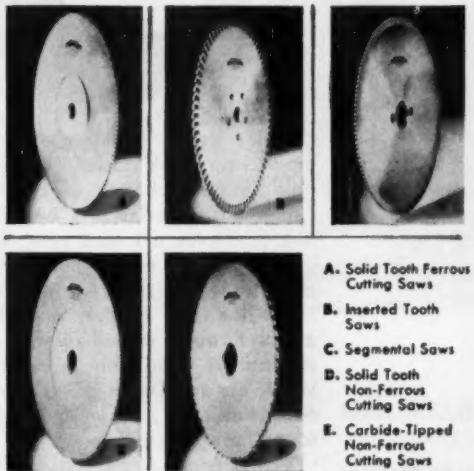
For more information on which blade is *best* for your job, ask your local Simonds Industrial Supply Distributor who stocks them, or write for Simonds Circular Metal Cutting Saw Bulletins today.

*Steel Analysis Patented



A. Solid Tooth Ferrous Cutting Saws
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troduced by consent and example. Example is always better than precept. I recall reading, in a recent issue of *American Machinist*, a short account of the Gisholt company trying to get one hundred percent acceptance of wearing goggles on the plant.

No effort was spared, and goggles were a free issue, to become a "personal effect" if a worker left the company after eighteen months' service. One of the efforts was an edict to the effect that *all* employees, from the president down, were to wear goggles during all work-hours. Clercial, design, etc, were all included; and not only those employed in the workshops. I don't know how the president of Al's company would relish safety boots if he decided on the sacrificial gesture of setting the example! The back-room boys and front office staff would look askance at the proposal, I feel sure, and I shudder to contemplate their effect on the nylons of the president's secretary, not to mention her calfs.

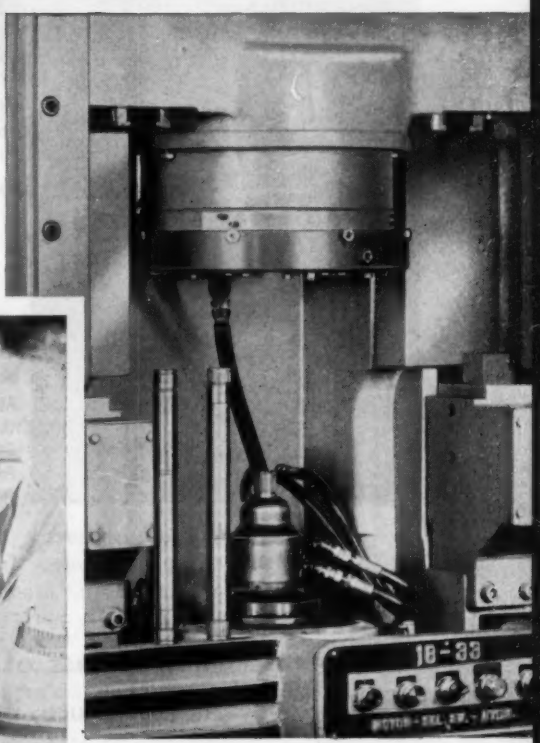
On the whole, I think safety boots is a matter for agreement, not compulsion. I have many men who favor them but can't wear them, and others who could wear them but don't favor them. I don't blame them; in their present form I wouldn't wear them for all the tea in China. I am, of course, writing from my experience of safety boots over here in Britain. Design may be more attractive on the other side of the "pond;" let's hope so. In the place where I work, the boots are supplied by the welfare section at wholesale price. The company contributes nothing and there is no company recommendation except in

"We did away with destructive vibrations all right, but now the operator wants flight pay."

This Month's

GEAR PIX

AUTOMATED SPEEDER...facilitates speeding of production gears in mesh with an accurate master or a master mating gear. Inspector places gears to be speeded in the chute, and flicks a lever to divert any rejects that exceed sound level requirements. Cycle time on helical gear shown is 6 seconds.



12 & 15 SECONDS, respectively, is the cutting cycle time for the ⅞" and 1¼" width splines on an 18-33 Shear-Speed gear shaper. The 28-tooth, 24-pitch splines are formed on a relatively thin-walled hollow shaft adjacent to bearing surfaces.

SPLINES ON AXLE SHAFTS cold formed automatically on the Roto-Flo spline roller.

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"One day we were using 14 hand sprayers ...the next day, 2

"One day we were using 180 gallons of paint ...the next day, 75

Fantastic? "Not exactly. It's a typical, on-the-job-example of the savings made possible with the

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And, in this instance* production was increased; quality of the work improved, and rejections cut to practically nothing.

* Fluorescent Fixtures of California, in their modern plant in South San Francisco, uses the Ransburg No. 2 Process Reciprocating Disc Atomizer to paint their popular line of ALL-BRITE lighting fixtures. The quotes above are from Works Manager, R. H. Shaffer.

Regardless of the type of product you manufacture, if it's painted... and, if your production justifies conveyorized painting, you should look into the savings (and improved quality) which can be yours with one of the Ransburg Electrostatic Painting Processes. May we tell you about complete Ransburg services?

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Ransburg ELECTRO-COATING CORP.
Indianapolis 7, Indiana

RANSBURG

the form of prominent posters eulogizing their merits. If, however, compulsion was applied, I feel certain there would be few takers.

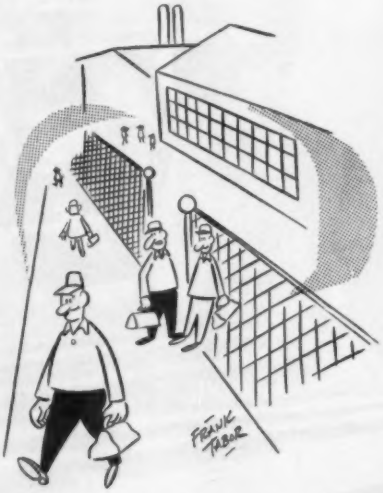
All thinking people connected with industry will welcome safety boots and any other device calculated to promote the safety of the workers; but my point is that safety would be more readily sold if more attention was devoted to appearance. I feel strongly that that is a matter crying out for immediate action by the safety experts.

C Donald-Mackinnon
Lanarkshire, Scotland

LET'S SEE NOW, what goes on there? It looks to me like things around the what-you-may-call-it Machine Works are once more in an uproar over some man having dropped a steady rest on his toes, so the man will be laid up for quite some time.

Such an incident will, of course, have some effect on production, because the man must be a humdinger on turning shafts. So now Al, the production Boss, is all het up over the matter and has one of his worrying spells coming on and wants all the men in his department to wear metal-capped shoes.

I think that is not a very good idea, unless the men have rest-aphobia which means they have a growing fear of steady rests dropping on their toes. Now, let us suppose the company stock holders (many of them also owning large slabs of stock in some sheet metal works) voted to adopt the idea, providing it would be O. K. with the men. Then there is great possibilities that other firms would install the idea of em-



"He thinks he's smart. He cut the bottom out of his lunch box so nobody can nail it down."

R B & W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

The Proper Loading of Bolts

The pre-load, or residual tension, in a tightened bolt means more to assembly strength than the actual strength of the bolt itself.

In a joint, a bolt torqued to its proper load level resists a maximum amount of external load without loosening. Designers can take advantage of this fact and assure better results, and at the same time, cut costs.

For example: One designer calculated that truck frames needed high strength bolts at least ½" in diameter. So he used ⅝". But on the assembly line, these were being torqued to 100 ft.-lbs. whereas they needed at least 200 ft.-lbs. for proper residual tension. The ½" bolt at 100 ft.-lbs. would actually have given the stronger assembly and at less cost.

In another case, the bucket on earth moving equipment was always coming loose. The design engineer kept increasing the size of the bolt up to 1¼", but to no avail. The impact wrench used was supplying far too little torque for this size. We suggested a return to the original ¾" bolt used, set up to 350 ft.-lbs. torque. It solved the problem.

In short, the more you stress a bolt within its elastic limit, the greater its ability to stay tight and make a strong assembly.

Symmetrical flow lines assure strong bolt heads

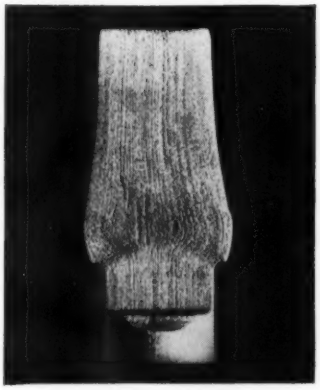


Photo of perfect cold worked blank after first upset.

Effect of improper forming is a poor head like this.

IN THE manufacture of bolts and cap screws, the first upset of metal is a vital one. It determines the flow lines in the bulb which will form the head. A symmetrical flow assures no laps and, therefore, no weak spots or cracks in the final upset of the head.

MACHINE OPERATOR'S SKILL VITAL

The upper photo shows a longitudinal section of a blank after the first upset and on its way to becoming an RB&W standard bolt. Note the even distribution of flow lines. This bulb will become a perfect head.

The lower photo shows what can happen with poor tools, inexperienced operators or without precision setup of the cold headers. Note how pronounced is the unbalanced flow pattern which resulted from a bulb with just a minute defect.

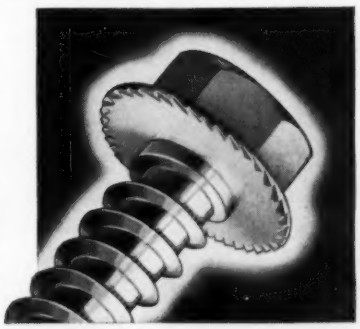
DEPENDABLE FASTENERS

Cap screws and bolts also get a bright smooth finish from the right kind of cold forming. But above all, they offer the designer low cost fasteners with sound internal structure. Standard RB&W fasteners can be loaded to their proper level —become a strong point in any assembly.

For help on your fastener problem, contact Russell, Burdsall & Ward Bolt and Nut Company. Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

The Only Screw That Stays Tight

The continual heating and cooling caused loosening of handle screws on the flat irons of one manufacturer. Every type tried failed to stay tight until RB&W's unique Spin-Lock tapping screws were used. This solved the problem. Their hardened teeth lock into the surface, require more torque to loosen than to tighten. One piece fasteners, they speed assembly time.



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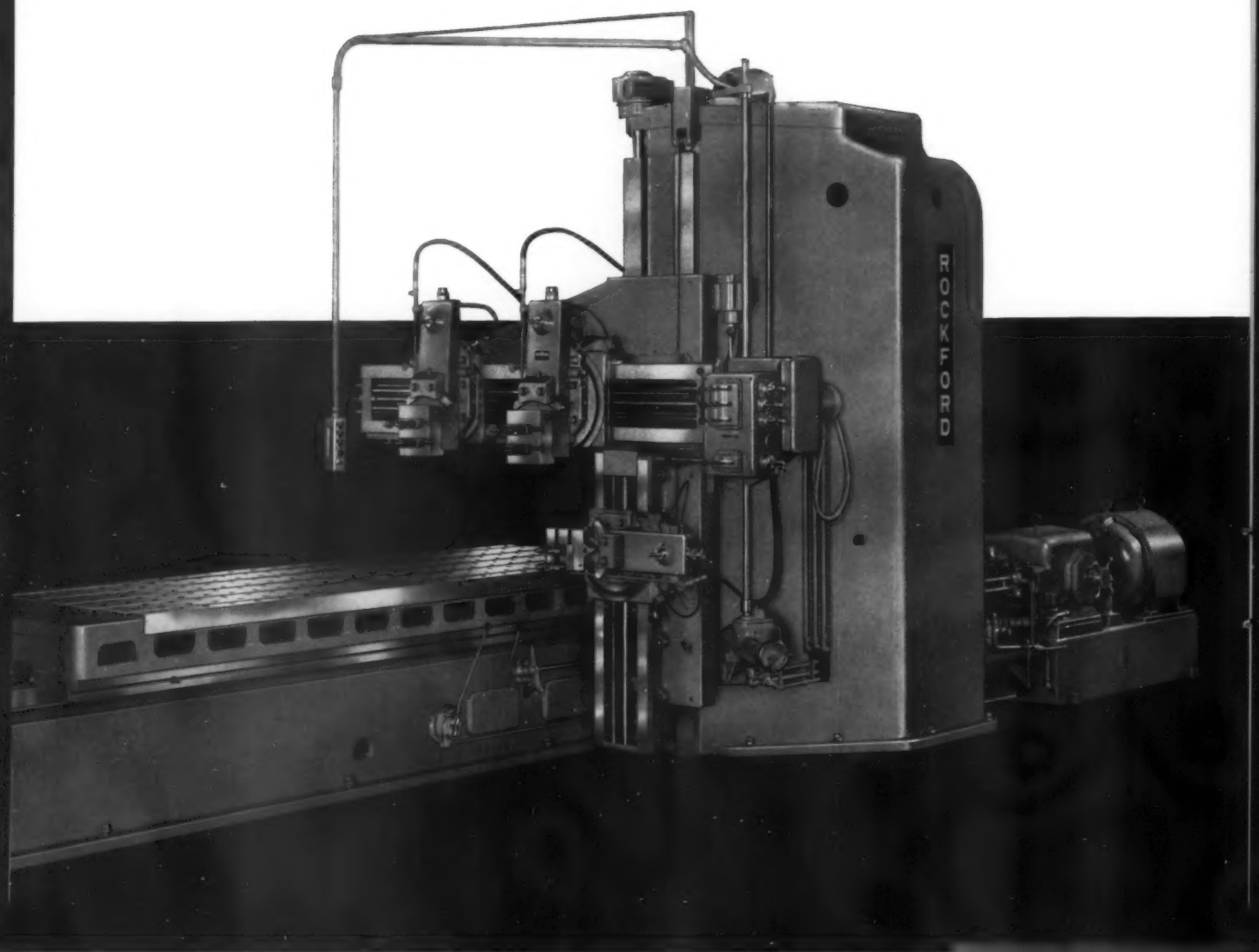

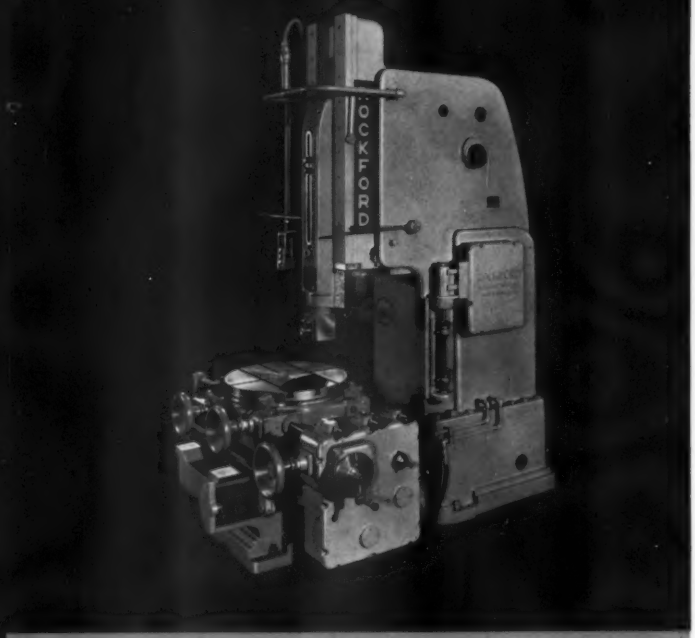

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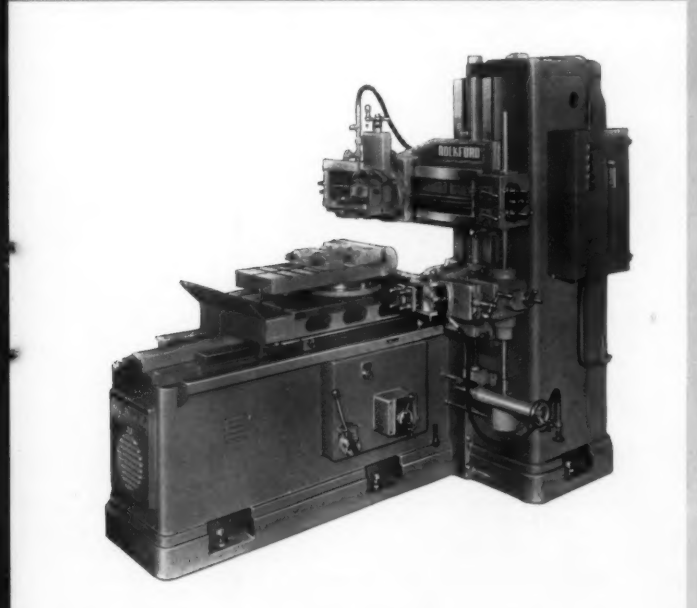

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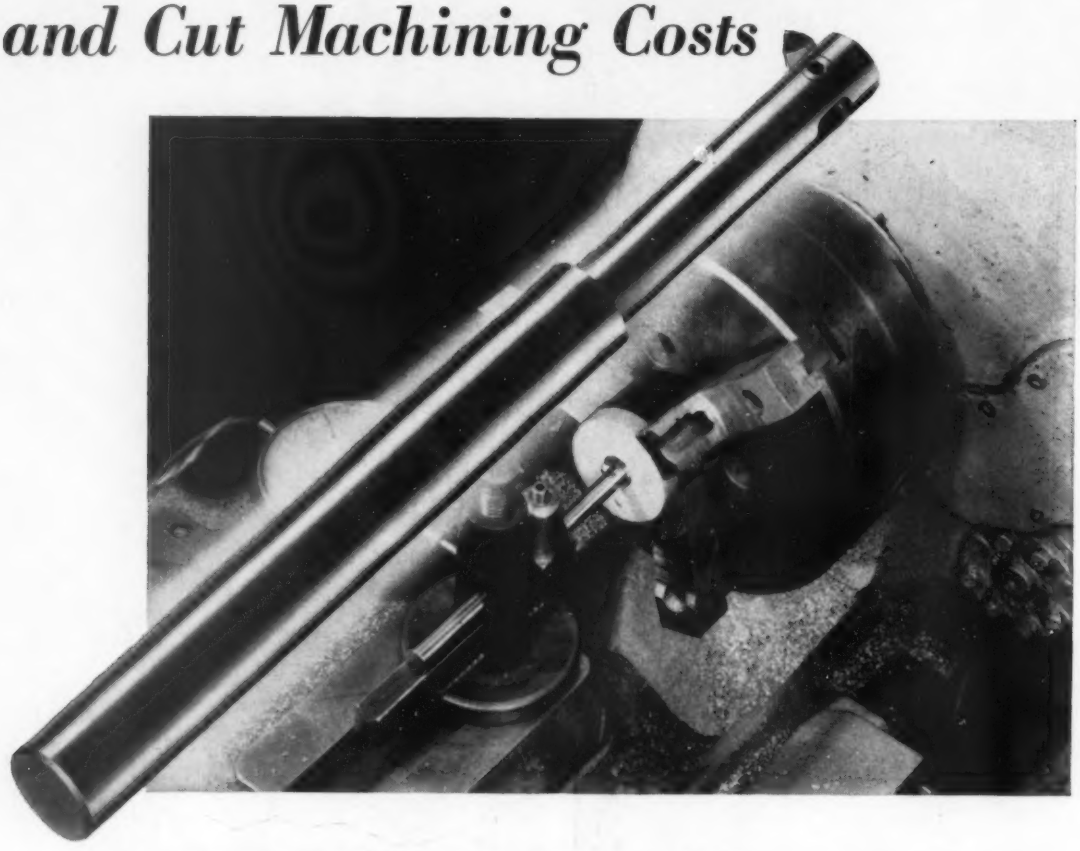

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VIBRATION of cutting tools can be nearly eliminated and overall machining costs substantially reduced when you use Mallory No-Chat boring bars. Made from a unique alloy developed by Mallory metallurgical research, they are more than twice as dense as steel, and have far greater rigidity, tensile strength and thermal conductivity.

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ployees wearing metal-cap shoes. (Business is business no matter how you look at it.) Thus in a short time, the sheet metal stock market would go up and up, and also the shoemaking firms would be working overtime. So much for that.

Since the human body is not subject to being injured in the same place at all times, I am wondering how come that Al never thought of fixing his men up with some nice fancy shin guards. Those are parts (the shin bones) that need protection. I myself have quite a collection of kinks in my shin bones, having gathered them by bumping into castings and other assorted junk during my fifty years sojourn in many machine shops. The kinks are part of the price a machinist pays for experience, but I firmly believe the average man will prefer to gather shin bone kinks, instead of being forced to wear gadgets.

No, let's stop this sheet-metal guards, right now. We are Americans and want to remain free and we don't want Al, or anybody else, to make any attempt to convert us into robots.

Pencoyd Charley
Los Angeles, Calif

IT IS to the benefit of both employee and employer to eliminate as much as is physically possible, such things as accidents which interfere with smooth-running production in many ways. No effort should be spared in making for a high degree of safety. This can be accomplished most effectively by the use of sound common sense, where a little serious thinking supplants rash judgment. To augment extra care with material aids oftimes does some good.

My two hands are scarred with evidence of carelessness. In my eagerness to accomplish completion of my work so as to get on with something else I was prone to take chances. Had I done the right thing I would have said to myself, "Easy does it, now; don't take such a chance." There are times, however, when an accident will happen regardless of how careful one is, be he equipped with armor-plated boots, bullet-proof vest, or stainless steel-rimmed, plate-glass specks or what not. These times, which are rare, cannot be blamed on the victim's carelessness.

Of a certainty man cannot bedeck himself with heavy footwear, for instance, and be light on his feet to enjoy his work as he should. A worker cannot produce as much if

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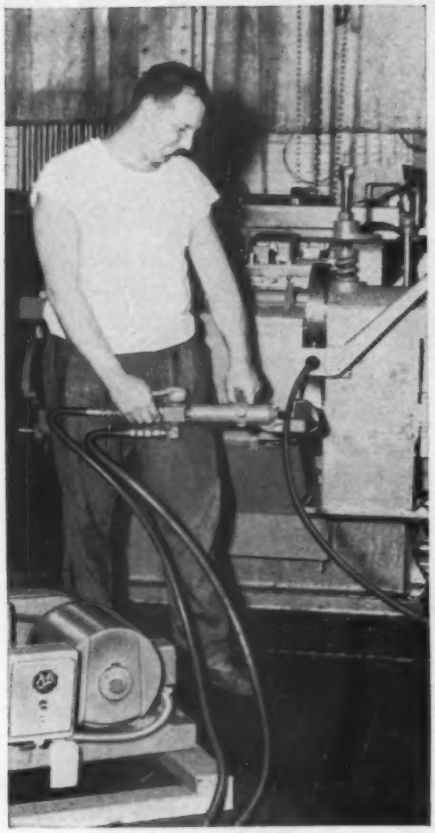
Hydraulic Rod Straightener



Fast, easy to use, the Manco Rod Straightener can be operated by hand valve as shown above or by foot valve if desired.

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he is cluttered down with heavy garments, or has to drag around a couple of Sherman tanks all day long. If a company is going to insist on a worker wearing reinforced boots, it seems to me that it is up to that company to furnish them. If the nature of the work is such that a man's tootsies are in danger of being smashed, I see no reason why they shouldn't be protected with reinforced footwear. Just because a man is so protected is no reason why he should get careless. Shock-resistant clobbers, armor-plated boots, or any other form of protection will not prevent accidents if the worker doesn't use sound judgment at all times. A sympathetic reprimand, if it can be so called, by the foreman—"Too bad, Bill; should have worn the safety shoes," is not sufficient to prevent a repetition. The worker should be penalized in some more effective way to make him realize that his violation of safety rules has been costly to himself and the company.

The one thing that I do feel should be stressed among the workers is the importance of wearing goggles whenever they are engaged in a work of such a nature as to endanger the eyes. The eye is a delicate and vulnerable piece of equipment which, when it is put out of commission, calls for sad music. I'm rather opposed to the wearing of safety boots because the injuries they would save a man from are mostly brought on by carelessness, but I'll take a Hitler attitude about the wearing of safety goggles, "You half to vear dem."

While I favor such necessary precaution, I must confess to my own disregard of the rule at times through the press of time—my own desire to get the job done as soon as I could do it. Fortunately I still have two pretty good eyes that

"Guess who's wanted on the phone."

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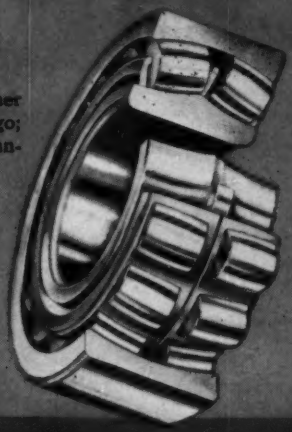

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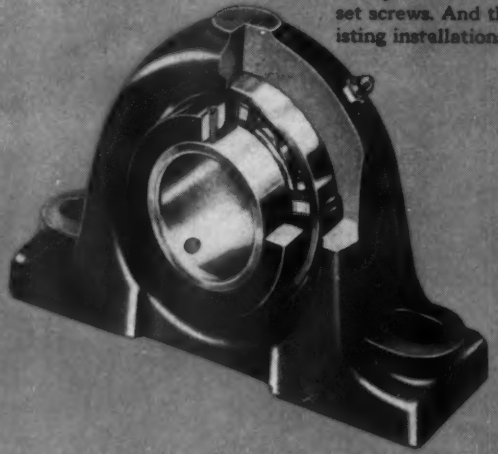

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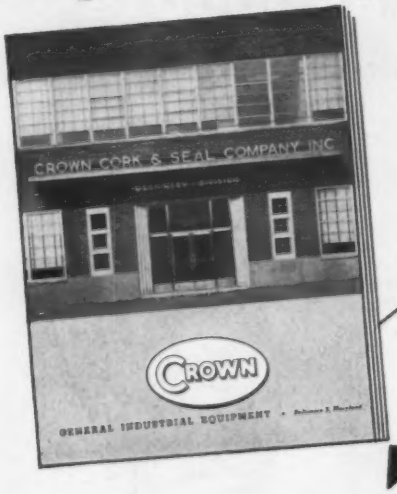

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manage to function very well with the aid of corrective lenses. There have been times when I would get particles of emery in them through my own failure to heed the goggle-wearing warning. That in itself is bad enough, but I had to make matters worse by trying to remove—which I usually succeeded in doing—the obstruction with the aid of my sharp pocket knife. If I had a buck for every piece of emery I have taken out of my own as well as other's eyes I could sit back and relax, but wow! did I take chances!

The question is, are we going overboard with this thing of safety measures to the extent that a worker is handicapped in performing his best work? Do I vision a twenty-first-century toolmaker or machinist going the rounds with a seventeenth-century armor suit equipped with directional antenna to guide his way through the maze of automation equipment?

Frank Van Horn
Auburn, Calif

OBVIOUSLY, no company has the right to insist that all workers wear safety shoes, any more than they have the right to insist that their employees wear a certain type of work shirt. But they can suggest—and Murphy will do as a "horrible example"—that for their own sake it might be wise to wear safety shoes. If they back up the suggestion by offering to pay all or part of the cost of the safety shoes, I am willing to bet that at least niney per cent of the work force will be wearing this type of shoe in a matter of months. The remaining ten per cent will be composed of the diehards who cling to the belief that what they wear is

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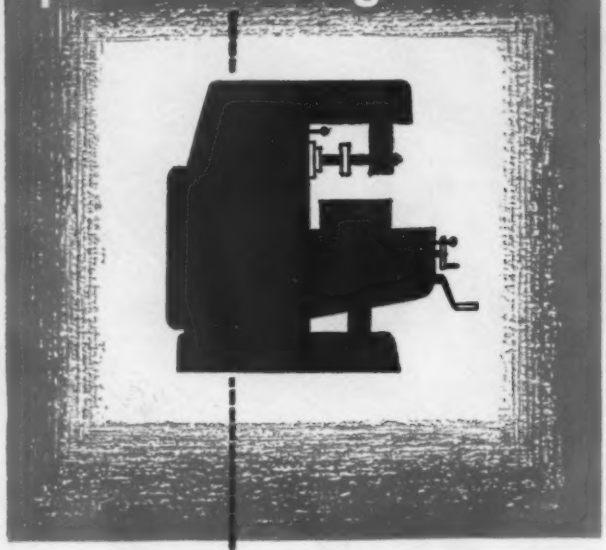

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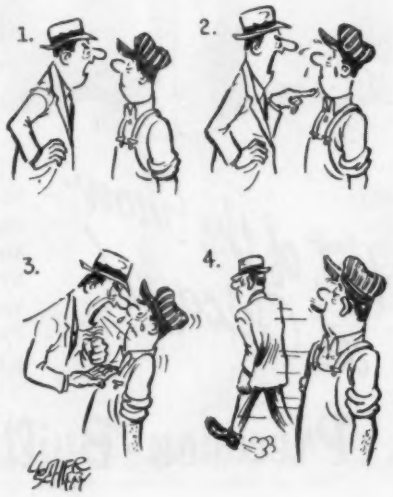
entirely their own business, also quite a few who are physically unable to wear this type because of foot trouble, and, of course, the office force who do not have shop hazards to contend with.

Suppose a company decides to stress the safety shoe angle without making an effort to defray any of the expense to the worker? Well, frankly, I don't think they will get very far; for the same reason that our friend Ed cited. That is, that the average worker does not make a point of buying shoes exclusively for work. I am referring to the factory worker, especially in the machine shop fields. Of course, the farmer and construction worker are in another category. From a long experience in machine shops, the facts are as Ed stated, the machine shop workers's shoes have undergone quite a lot of outside wear before they are relegated to the shop.

For economic reasons they make the transition from Sunday best to "good enough for work" in anything from a year to eighteen months. I say economic reasons advisedly, because the average family man does not feel financially able to buy two pairs of shoes exclusively for work in a year, which is the average life of shoes exposed to oil, coolant, chips and all the ills that shoes worn in the machine shop are heir to.

So, I suggest that any company that feels sold on the idea of safety shoes for the shopman might study the economic aspect from the worker's point of view and come up with a plan that will ease the strain on his pocketbook. First, they could furnish safety shoes as they furnish perishable tools. Second, defray part of the cost of safety shoes. Thirdly, and I think most advisedly, contact a

(Continued on page 242)



Tool Steel Topics

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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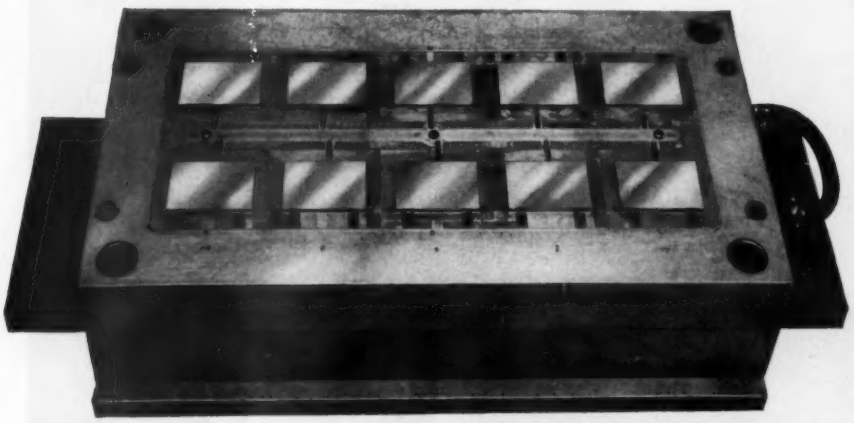
PLASTIC BOXES BY THE MILLIONS WITH Dies of BTR

This die, made of BTR (Bethlehem Tool Room) tool steel, is typical of the dies used by Hake Manufacturing Co., Inc., Roanoke, Va., makers of plastic boxes. The die is used in injection molding of plastic parts of polystyrene, the BTR being used for the die-cavity, cores and runners.

The die is hardened to Rockwell C 56-58. The cores and cavities in the molds are highly polished to a rich, mirror-like finish, to provide a smooth, glossy surface on the completed product.

BTR is our general-purpose, manganese-chromium-tungsten grade of oil-hardening tool steel. It is economical for plastic-molding because it is easy to machine, and has a long service life. BTR can also be polished to a high surface lustre, which it retains indefinitely.

To place a trial order for BTR, or if you would like to have additional information about this fine tool steel, just call your tool-steel distributor.



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Talk about economy! With Red Sabre Tool Bits, you get fast cutting, smooth surfaces, fewer grinds, and more metal removed per dollar. Red Sabre is a high-speed steel containing approximately 1.50 carbon, 12.00 tungsten, 5.00 vanadium, and 5.00 cobalt. That means high red-hardness and surface-hardness for unusual resistance to surface wear, and for maximum cutting ability. Besides, Red Sabre Tool Bits are hardened to Rockwell C 65. They are a good buy, always!

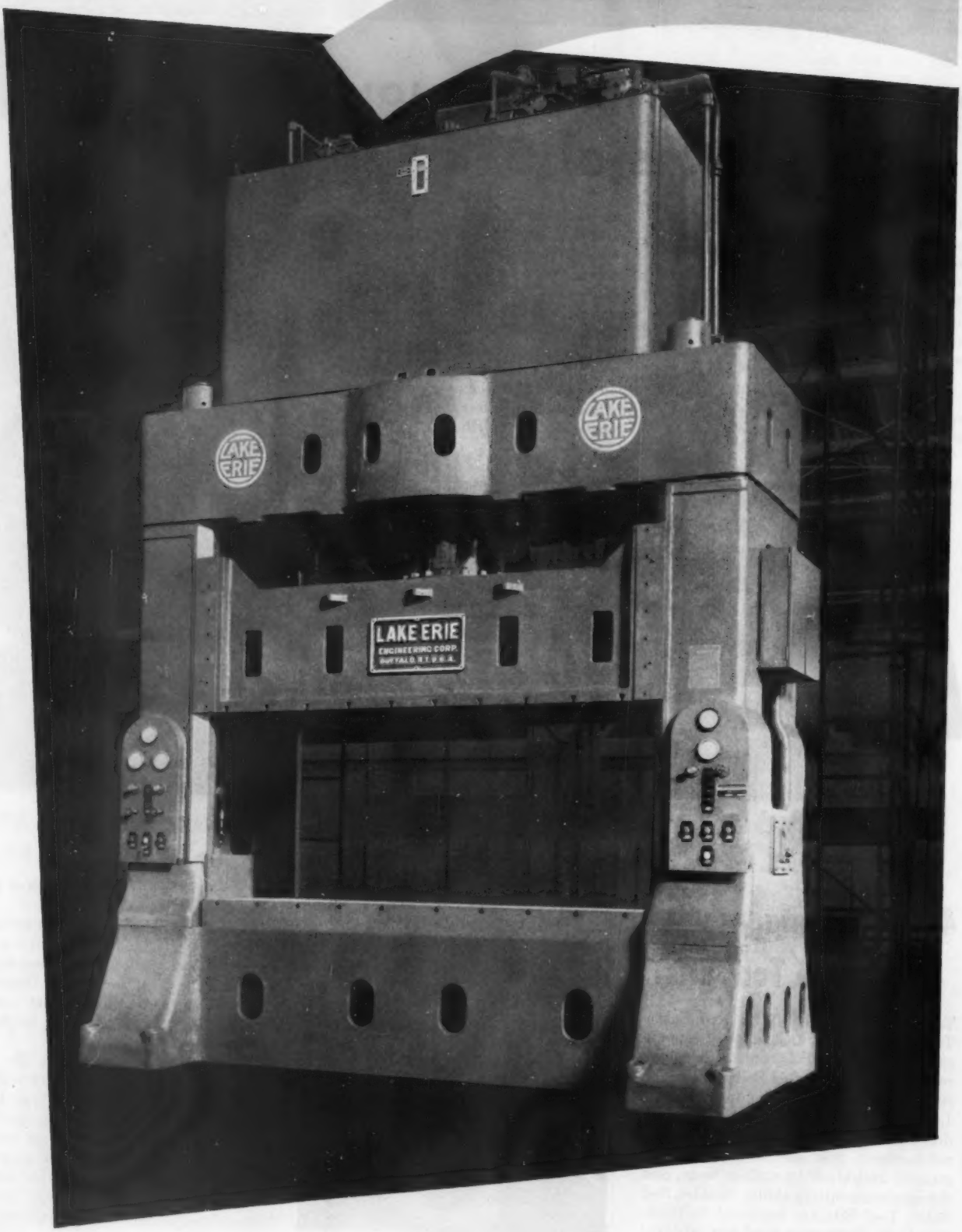
BETHLEHEM TOOL STEEL ENGINEER SAYS:

Billets Are Billets (Not Bars)

"Billets are billets" is a truism similar to "Pigs is pigs," and is just as appropriate. A tool steel billet is a semi-finished product intended for use by forging to desired size. It is definitely not intended to be used to make tools by machining, as is bar stock.

This distinction may seem like hair-splitting, particularly if you have already machined tools directly from billets (when the correct bar size was not available) without encountering trouble. Although trouble does not develop every time billets are used in this manner, machining still remains an incorrect procedure, and should always be avoided.

DESIGN POLICY IS THE



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... *bronze piston heads, gland bushings, and pre-fill valve disc prevent scoring.*

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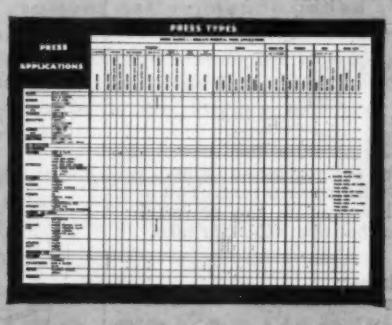

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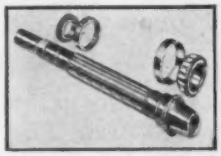
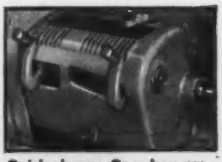
This is a completely new Sebastian Lathe *designed and built by Sheldon* . . . a rugged work horse with extra power, toolroom accuracy and all the modern features that make for money-saving production . . . with all controls centrally grouped in easy reach for safe efficient operation.

Modern, heavy cast-iron pedestal (included in base price of lathe) completely encloses motor and drive . . . with storage space in tailstock leg for tools and chucks.

Speed changes easily made by revolving speed dial on headstock



Heavy, multiple Splined Spindle with "Zero Precision" tapered roller bearings



Quick change Gear box provides 60 different threads or feeds — has built-in lead screw reverse

Massive 1-piece, double walled apron with gears running in oil has "1-shot" pressure lubrication system for carriage and ways

Cam action tailstock clamp permits rapid release and instant locking of tailstock

Run this new Sebastian lathe. Test its performance. You will appreciate the powerful cuts that this lathe can take.

Write for circulars on 13" and 15" Sebastian lathes and name of nearest dealer where you can see and operate these outstanding lathes.

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Builder of Sheldon Lathes, Milling Machines, Shapers and Sebastian Lathes

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reliable safety-shoe manufacturer to furnish their employees safety shoes at a discount, to be deductible from the employee's wages in small amounts per week.

In some large concerns employees pledge a certain amount to the various charities, deductible in weekly amounts from the pay envelope. Why not use the same method in supplying the worker with shoes that will protect him from the everyday foot hazards of the shop?

Robert S Alexander
Glastonbury, Conn

UNFORTUNATELY there are thousands upon thousands of accidents like Murphy's. And lots of them are far more serious than in this case. Murphy should be glad if he is in working condition again after a month or so. In some cases foot damages are so serious that the one hit may never again regain his former health. Besides, there are many more accessories and tools harder than a man's foot.

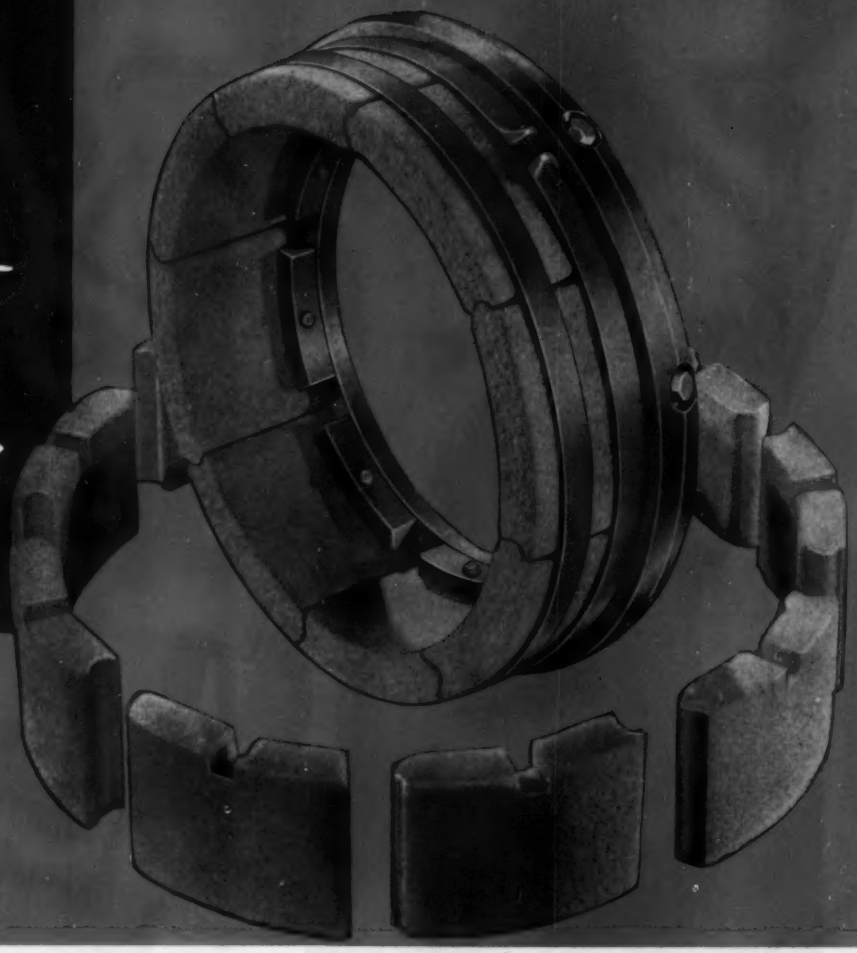
I don't think Ed should worry too much about the shaft job. Instead he should regret that he hasn't taken effective steps earlier to prevent such accidents.

I agree with Al that Ed has been having good luck without realizing it, also for the reason that Murphy was not more seriously hurt. He should certainly have been wearing safety shoes for at least fifteen years past. But it is still more regrettable that the guys don't wear them even today. If Al is a foreman who is thinking of accident prevention he is a very valuable one. Ed should also be safety-minded.

Ed's economy claims are all wrong. If a man has a pair of shoes that

"I won't bore you with a lot of figures gentlemen, briefly . . . we lost our shirts."

for profit's sake—

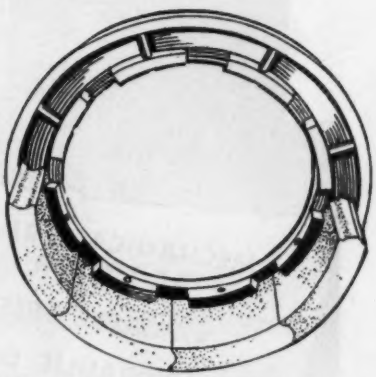


Use Sterling's No. 2 Chuck and Segments on every Surfacing Job!

Sterling Chucks are light-weight, not complicated, readily handled, quickly installed. They are easy on bearings. This reduction of weight makes for unusual efficiency—more power is used for grinding rather than operating the chuck. The Sterling No. 2 Chuck is safe—always. Its individual mountings provide a positive segment grip easily regulated by a simple twist of a socket wrench. Adaptable to all surface grinders, Sterling No. 2 Chucks are supplied to take segment rings from 8" to 30" in diameter. There's one for your machine!

Sterling's interlocking segment design means added strength throughout the entire abrasive ring, presents no dangerous projections to catch on materials being ground. The minute air spaces between segments mean cooler grinding, wider spread of coolant, better finish without chatter marks. Identical in design, Sterling Segments always fit your chuck, firmly and rigidly.

A Sterling engineer, skilled in solving hundreds of similar jobs, will gladly work with you and recommend the segments needed to speed up your surface grinding jobs. Write or wire us today.



Here is shown Sterling's famous chuck and segment assembly. Note the eight segment-holding units and the interlocking segment design. Easily removed, readily replaced, these superior segments in Sterling's No. 2 Chuck are a winning combination every time!

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STROKE LENGTH
UP TO 200 INCHES
SPEEDS UP TO 50 FEET/MIN.
ONE LONG STROKE—
ONE PART
OR
MULTIPLE SHORT STROKES
ON MULTIPLE PARTS
CONTINUOUS OPERATION

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UNIFIED BROACHING is the key to successful broaching

are beaten up and uses them in the shop, why can't it be a pair of safety shoes? I think the trouble about that is that people think safety shoes must be heavy and ugly looking. But this is not the case. There are safety shoes on the market today that are as neat looking as any smart shoe worn on the streets or in the homes. It is not necessary to wear lumber-type boots in the shop to protect one's feet.

I don't quite understand Ed's pessimistic view about his men wearing safety shoes. I wonder if he ever tried to do something about it? It is, however, a simple problem of organization — that's all. If I were in Ed's place I would take the matter up with the management and ask for samples of safety shoes, show them at the next foremen's meeting, and ask for support to introduce them all over the place. I am sure the management would have no objection, because this would be no economic drawback for the company. The loss through accidents would be less. No compulsory measures would be necessary either, if the problem is handled right. To gain cooperation with workers Ed should call the shop steward to his office, show him the samples, and tell him what he was about to put before the management.

If such shoes were sold to the guys at net factory price, the workers would gain on their shoe economy, so there would be no need for the company to foot part of the bill either.

Should anybody balk because they think their sacred rights were violated, they should be ignored. No sound mechanic will object to a measure that evidently would protect their feet. There will be no riot

"I know this is silly but I have to ask. Did you have your goggles on when you sprained your ankle?"

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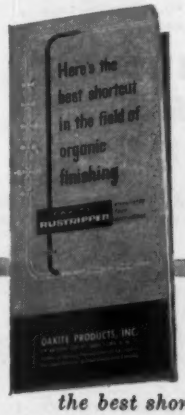
One tank may eliminate many tanks used in ordinary cycles.



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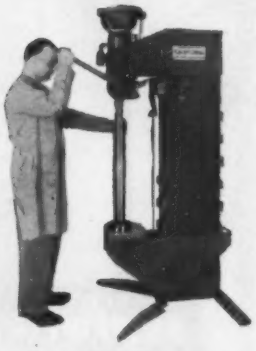
Model MWMD Motor Operated Hydraulic Gap Press



Model MWAO Hand-Air-Oil Operated Hydraulic Gap Press

*U. S. Patents Pending and Applied for.

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- **EXCLUSIVE K. R. WILSON TILT-LOCK* SYSTEM** holds bed securely in each position. No extra adjustments needed.
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- **15 AND 25 TON CAPACITIES** available in hand-air-oil or power-driven models. Choose from 8 standard models or have K. R. Wilson's engineers modify to your particular requirements.
- **AND LOW IN COST!** These fully hydraulic presses, with adjustable bed, cost no more than ordinary fixed bed mechanical presses.

These are the facts, now get the details on K. R. Wilson's amazing Adjustable Bed Gap Presses. WRITE FOR BULLETIN No. 79 TODAY!

K. R. WILSON, Inc.
HYDRAULICS DIVISION
202 MILL ST. ARCADE, NEW YORK, U.S.A.

because of the safety shoes question. Machine shop employees are not that stupid.

A E Fristedt
Stockholm-Bromma, Sweden

THERE ARE a great many occasions in this life where measures must be taken to force human beings to protect themselves. Apparently they are a race of gamblers. We have but to look about us to see people running across streets against traffic lights, jumping off trains before they stop, or adjusting and oiling machinery with the power on. They are gambling the loss of life and limb against the saving of a few seconds.

The toll which modern industry extracts in human life and limb is very great indeed and can only be measured imperfectly. Even if the statistics were complete, they could never tell the complete story. The voice of sorrow is weak and not heard by many except those whose misfortune it has been to experience the tragedy. To statisticians each accident is an entry in the report. Employers and their families, financially secure, and an indifferent public lulled to sleep in the superficial and thoughtless satisfaction of having its wants regularly filled, can hardly be expected to sense the misery and suffering in the wage earners' home into which serious accident or death has come as the price of employment in modern industry. To the individual wage earners an accident means physical suffering and financial loss, for even in the states where the compensation law is liberal in its provisions,

"I like to check with my foremen occasionally. How are you getting along with the men, Hoskins?"

March 19-23

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Perkins Machine & Gear Company
101 Circuit Avenue, WEST SPRINGFIELD, MASS.

he only receives part of his wages. If the injury is permanent, or results in death, the wife and children are compelled to lower their standard of living.

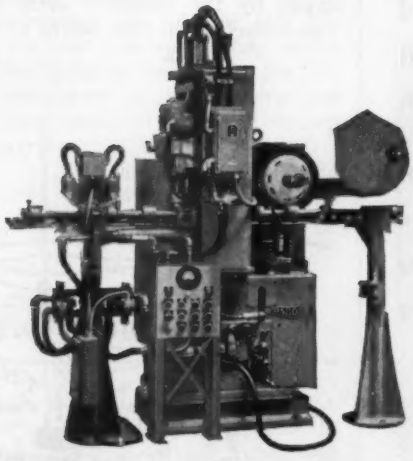
Through the years the accumulated losses resulting from industrial casualties, to which the public gives little or no attention, are said to exceed greatly the human cost of ware. This surprising statement serves to bring forcibly before us the staggering price which mankind has paid in human lives for the high development of the industrial system.

For the employer, industrial accidents mean decreased production, increased overhead, greater labor turnover, increased spoilage and direct financial outlay through compensation and insurance premiums. This loss of production develops from the temporary absence of slightly injured employees who must spend time at first aid stations, from the extended absence of the more seriously injured employees, and the impairment of skill and productive capacity of all employees following the resumption of work after an accident. The loss incident to industrial accidents is not confined to the worker and the employer. Society in general suffers. Periods of idleness and loss of life mean a great decrease in the productive power of the nation.

In view of the seriousness of the situation it behooves every one to make every effort to be safety-conscious. If the employer insists on safety shoes, the wiser, more mature employee, who knows what an accident can cost, should lead the way and encourage the other men in the shop to wear safety shoes. If the employer really knows the cost of an accident, he would not hesitate to

"I installed this TV so I could keep an eye on every man in the shop, but unfortunately I didn't put one at the water cooler!"

BRUSHAMATION BY OSBORN



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... all without manual handling.

Qualified engineers will show how you can benefit with automated brushing at the Osborn Booth 718, The Metal Show, Philadelphia, Oct. 17-21. If you can't make the show, write us for complete information. *The Osborn Manufacturing Company, Dept. C-37, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

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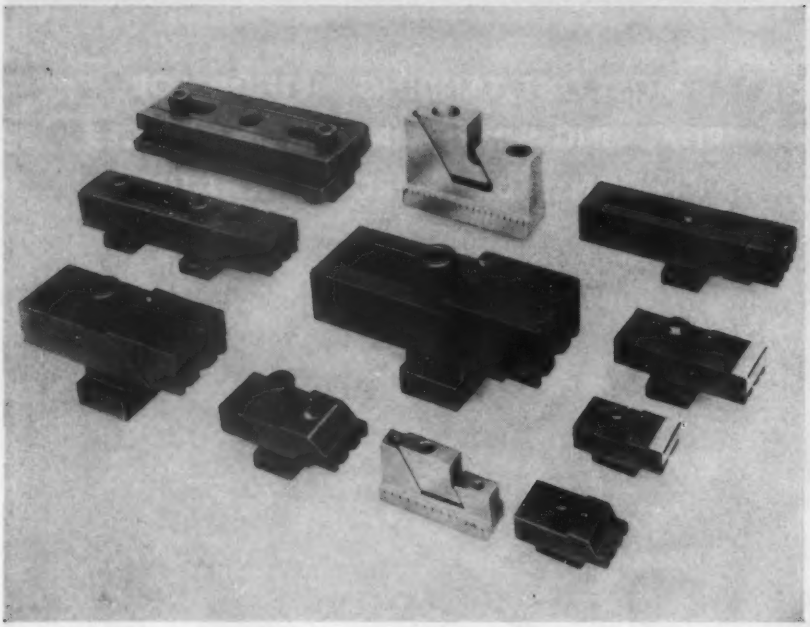

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pay half or even the full cost of the shoes. Safety equipment pays a high return on the investment for both the employer and employee.

Henry George
Bronx, N Y

PEOPLE SEEM TO HAVE little or no consideration for their limbs and other parts of their bodies. We go merrily on our way with no safety precautions. The reason? Because each of us feels he is smarter than the other fellow.

The use of safety shoes is one of the long but debatable list of safety measures. The old argument of using old shoes in the shop, and the cost of safety shoes, head the list of reasons why we don't buy such things to protect us from losing our toes.

It is false economy to lose two or three even four weeks of work because of a crushed toe, and even more unfortunate to lose the toe in the bargain. Whose fault? Probably your own . . . certainly if you were taking any precautions at all, it would not happen.

While it may seem to many of us foolish to purchase safety shoes for the job the one thing remains—this is what may save you a lot of doctor bills and the loss of employment. One never knows when that very steady rest or piece of equipment will fall on a foot. Many objects have the habit of dropping to the floor or ground at the slightest provocation or jarring. And if you are in the way and without the steel caps of safety shoes—look out.

It would be a good idea if the company would foot part of the bill. In fact the entire cost could be saved by the company since both the reduction in lost hours of pro-

"Me and my big mouth! Betting my wife I could walk into the plant past the guards with an alarm clock on my lunch box!"

duction and the reduced rate of insurance would nearly, if not more than, pay for a pair of shoes for each worker in the shop.

Safety shoes and safety glasses are probably the two most important items in today's battle against man destroying himself piece by piece. Oh, sure, you can collect insurance for the eye, or the toe, or the finger, but unless you want to be a blind man, or run around on 8 toes and 7 fingers . . . don't take chances. Don't try to be smart, use common sense and stay all in one piece.

A worker today must realize that he is part of a great industrial machine, the greatest in the world. He is a little cog, but one of the most important. Without him the machinery stops, the country's economy slips, and everyone — including this one cog—suffers.

To say no to safety precautions is like waving a red flag at the bull. You may get away with it, but chances are that sometime—bango—you're hooked.

Individualism is important to maintain, but use it in other ways where it does not personally affect your chances of staying whole and in one piece. Use your rights to Vote. Don't try to be smarter than your next door neighbor, and find yourself ending up on crutches.

Many companies today are insisting on their employees wearing safety shoes and safety glasses. Not because they are trying to take away rights of the worker, but because they are trying to protect the most valuable part of the great industrial machine of our times—the combined human race working for improved standards of living.

As foreman you should also follow the lead and wear safety shoes. Put the program over. Have the safest department in the company and get your share of praise from top management.

Edna Waugh Townsend
West Hartford, Conn

•

New Books . . .

BRAZING MANUAL— *By Committee on Brazing & Soldering, AWS. Published by Reinhold Publishing Corp, 430 Park Ave, New York 22, NY. 193 pages, 9x6. Price $4.75.*

The rapidly increasing use of brazing as a method of joining metals makes the appearance of this new

BARNESDRIL
HONING TOOLS AND ABRASIVES
give you these features!
Maximum Body Support At Cutting Edges
— results in freer cutting and less spalling
"Extra Deep" Plas-T-Clad Stones
— provide more usable abrasive and more positive support closer to to the cutting edge
Shell Mounted
Clamp Type
Skirt Mounted
Extra Deep
Conventional
Barnesdril
Plugmatic Sizing fo Positive Bore-to-Bore Accuracy
— sizes only on the bore, not affected by eccentric stone wear — self-aligning
Write for Catalog 500G
BARNES DRILL CO.
830 CHESTNUT STREET • ROCKFORD, ILLINOIS

Press operator Hannah Jones, who has worked presses of different makes for several years, prefers this 100-ton Warco to anything she has operated. Here she shows Personnel Director Myron Timms one of the reasons why—the increased production of tractor muffler heads.

"Since We've Tried WARCO Presses We've Bought Nothing Else"- - Says Leading Automotive Muffler Manufacturer

Company That Operates 130 Presses Has Purchased Only Warco Equipment Since 1951

The MacKenzie Muffler Co., Inc., is recognized as one of the nation's leading designers and builders of mufflers for the automotive industry. In the manufacture of their product the blanking and forming press plays an important part. In fact, this concern has more than 100 presses in daily use. In 1951 they decided to try their first Warco Press. They watched it closely, recording production and maintenance figures. "It sold itself to us," say company officials, "so well that we have purchased nothing but Warcos since."

Warco quality is like that. Once you compare you'll discover that Warco Presses outperform them all. It will pay to let your Warco representative know the next time you're in the market for press equipment.

Federal® WELDERS

Warco® PRESSES

THE FEDERAL MACHINE AND WELDER CO.
WARREN, OHIO

book of considerable importance to all manufacturers who plan to take advantage of the speed and wide range of applicability of the process. Here in a single volume is all the necessary technical information needed for brazing by torch, twin carbon arc, furnace, induction, resistance, block, and flow processes. Complete information is given on equipment needed, precleaning, surface preparation, postbraze cleaning, and inspection of both the common and the unusual metals.

Fluxes and atmospheres are standardized into types according to their composition and use, and there are important sections on testing, quality control, safety, and health protection. An appendix in chart form lists the properties of brazeable metals and alloys.

•

ELECTRONICS IN BUSINESS—*Published by Controllership Foundation, 2 Park Ave, New York 16. 174 pages. Price $1.50 to members of Controllers Institute, $2.00 to others.*

This is a bibliography and descriptive list on electronic data processing equipment and principles, designed to give executives quick reference to ideas or not-too-detailed information about the present state of electronics that can be applied to general business.

It covers over 300 periodicals and numerous books, conferences, and talks in the bibliography, presenting brief outlines of the subject matter covered. It also lists electronic data-processing systems, and lists installations and commercial centers where such equipment may be used. The list includes pertinent information and descriptions.

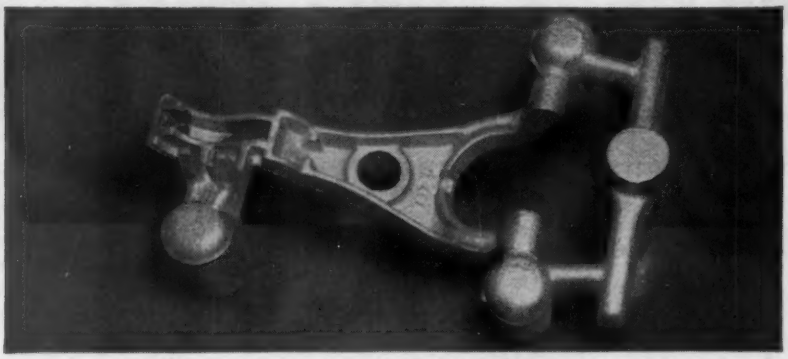
If such facilities as a digital computer are needed for business purposes, this reference will allow you to determine where to go, what the equipment can do, and how much it will cost.

•

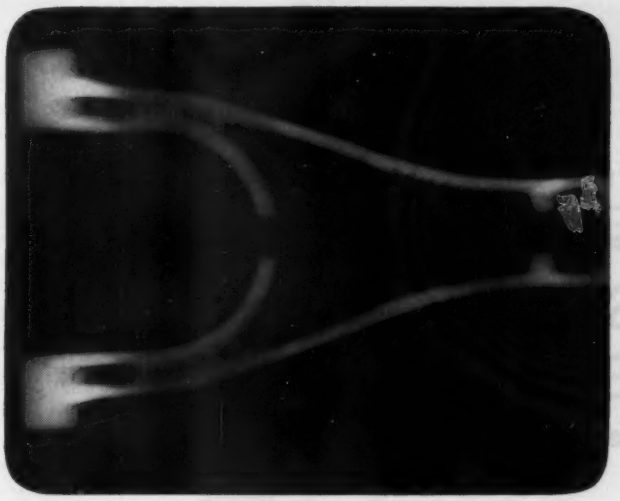
THE AUTOMATIC FACTORY—*By S A June, J D Bardis, L H Lurio, L S Polaner, O Sagedahl, H A Sklenar and B K Yenken. Published by Instruments Publishing Company, 845 Ridge Ave, Pittsburgh 12, Pa. 88 pages, 5¼ x 8 in. Price $1.50.*

This is the report of a team in the manufacturing course of G F Doriot at Harvard Graduate School, which

Shrink steals strength — and profits



— RADIOGRAPHY points the way to avoid it



THIS steel fork lever was designed to take a specific load. Would it hold up? Not if shrinkage had robbed its strength.

But here is where radiography came in with double-barreled effect. First the radiographs which were made showed the foundryman that internal shrinkage was present. Then the radiographs disclosed a recurring pattern of these defects, thus suggesting a change in molding which greatly reduced the difficulty.

This is typical of the ways radiography helps the foundryman make sure only satisfactory work is delivered and so builds a reputation for high-quality castings.

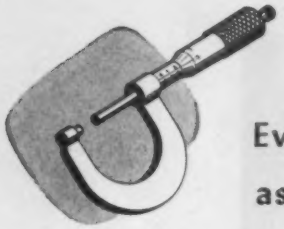
If you'd like to know how it can improve your own operations, talk it over with your x-ray dealer. Or, if you like, write us for a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY, X-RAY DIVISION, ROCHESTER 4, N. Y.

Radiography

— another important example of Photography at Work

Kodak



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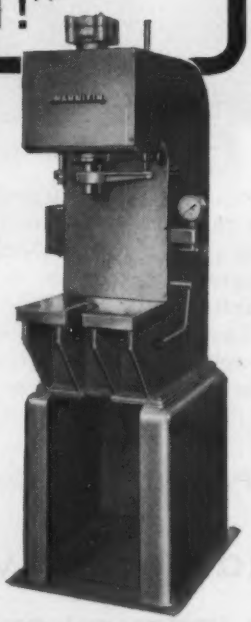


That's the price of this 5-Ton HANNIFIN Press*

A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

Hannifin Corporation, 517 S. Wolf Road, Des Plaines, Illinois

first appeared serialized in a magazine. "The automatic factory"—meaning a metalworking plant—is their subject, as distinct from the automatic *plants* common in the chemical and food industries for years. About six months of research and interviews went into the study.

The report attempts to bridge the gap between the theoretical and the actual and makes many good points in its summations. It is, however, limited to what six months of study by a graduate-student group can turn up. Thus examples of only two or three machine-tool builders appear, little or nothing of the Ford, GE and General Motors basic work, and not much of the really basic literature of the last seven years. Its best definition of automation is involved and confused; not the simple and broadly accepted "continuous automatic production."

•

FLANAGAN APTITUDE CLASSIFICATION TESTS—*By Dr John C Flanagan. Published by Science Research Associates, 57 West Grand Ave, Chicago 10, Ill. Six aptitude tests for machine-tool industry. 8½ x 11 in., paper bound. Price $0.13 ea.*

New aptitude tests for workers in the machinery industry help personnel directors predict on-the-job success of prospective machinists, welders, layout men, tool repairmen and sheet-metal workers. Followup studies made in connection with these tests show that employees are more successful in jobs for which they have the essential aptitudes.

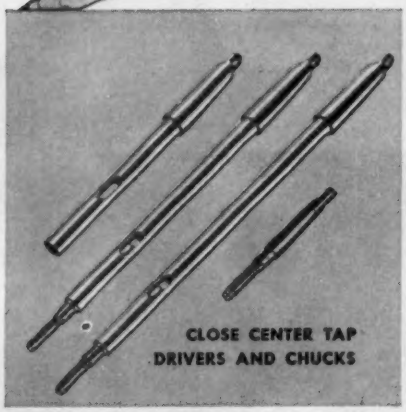
Tests are easy to administer either individually or in groups, and tests measure aptitude in the categories of *Inspection* (Test number 1) ability to spot flaws; *Precision* (Test number 4) ability to do precision work with small objects; *Assembly* (Test number 5) ability to visualize an object from separate parts; *Coordination* (Test number 7) ability to coordinate hand and arm movements; *Arithmetic* (Test number 9) skill in working with numbers; *Mechanics* (Test number 13) understanding of mechanical principles.

The test author, John C Flanagan, professor of Psychology at the University of Pittsburgh, and director of the American Institute for Research, states: "This system of classification has come not from the psychological laboratory, but from on-the-job analysis of those skills that are important . . ."

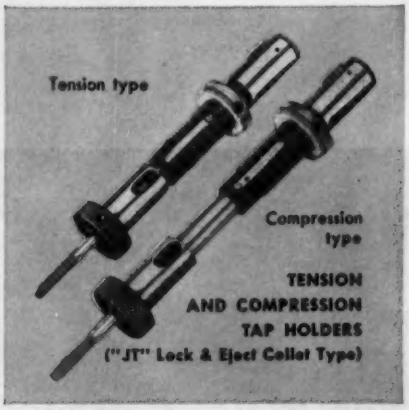
NEW Scully-Jones Tools for low-cost DRILLING AND TAPPING

• Cost reduction can be accomplished by improving production methods or by cutting product quality. Scully-Jones has always been the leader in improving production methods through the use of precision holding tools. The new tools described here can mean significant cost savings to you!

Drive large taps with ease and accuracy with the improved heavy-duty tap holder. Also useful for driving reamers, staybolt setters, flue expanders and similar tools.



These compact, sturdy tools offer trouble-free performance on close center and "hard-to-reach" tapping operations. Accuracy is assured because driver and chuck run true within .002 in.



Used on multiple spindle machines, these tools compensate for variations between spindle feed and tap lead. They eliminate costly feed changes, assure accurate tapping.

When driving straight shank drills, this new four-slot design greatly increases resistance to pull-out. Greater protection is provided against tool breakage and downtime.

Four-slot design provides collet action which grips the tap tightly and greatly reduces danger of pull-out. Accurate tapping is possible on very close centers.

Designed for driving combined center drills and countersinks, this tool has an offset splined section which gives a positive drive in the drill flutes and protects the cutting edges.

FREE— Copies are now available of Bulletin 4-50, "Tap Holders and Drivers," and Bulletin 1-50, "Drill, Reamer & Tap Chucks." (Revised July 1, 1955.) Send for your copies now!

Call your Scully-Jones factory-trained representative or distributor. Let him help you select the correct tools to reduce drilling and tapping costs by the improved production method.

Precision Holding SCULLY JONES *for holding precision*

Scully-Jones and Company

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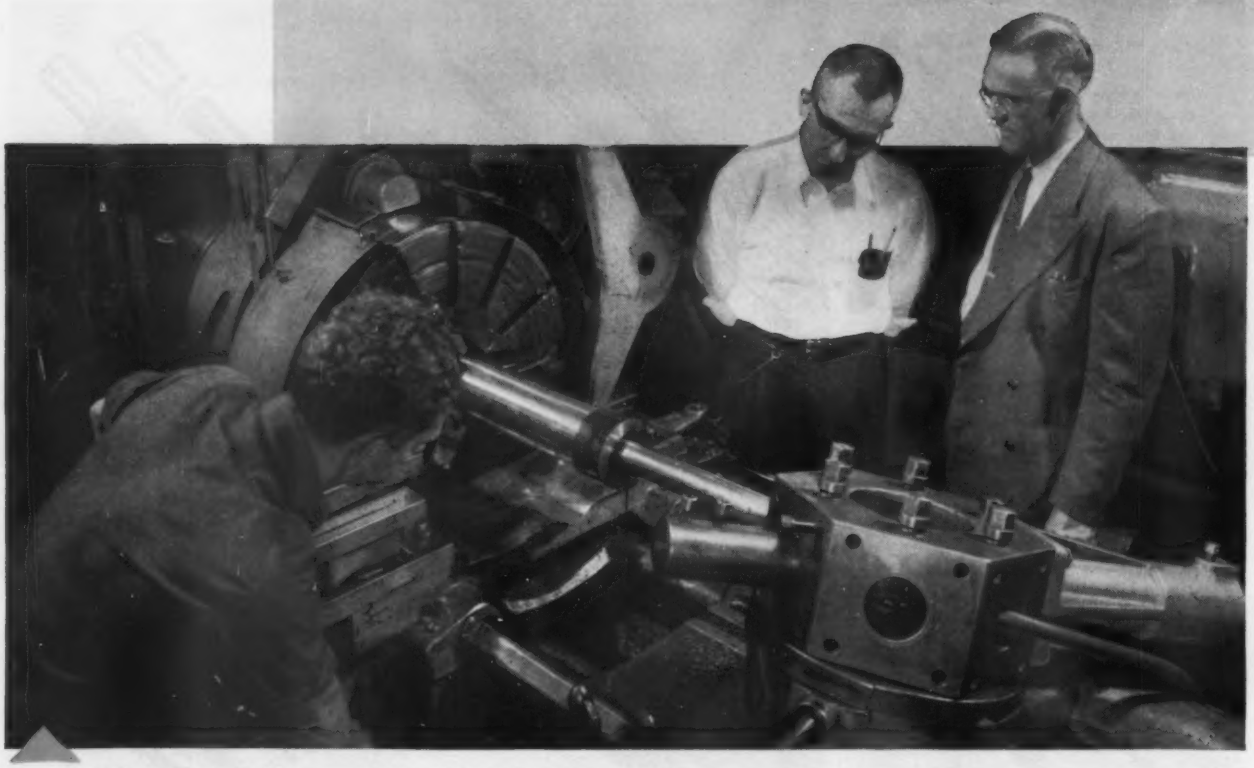
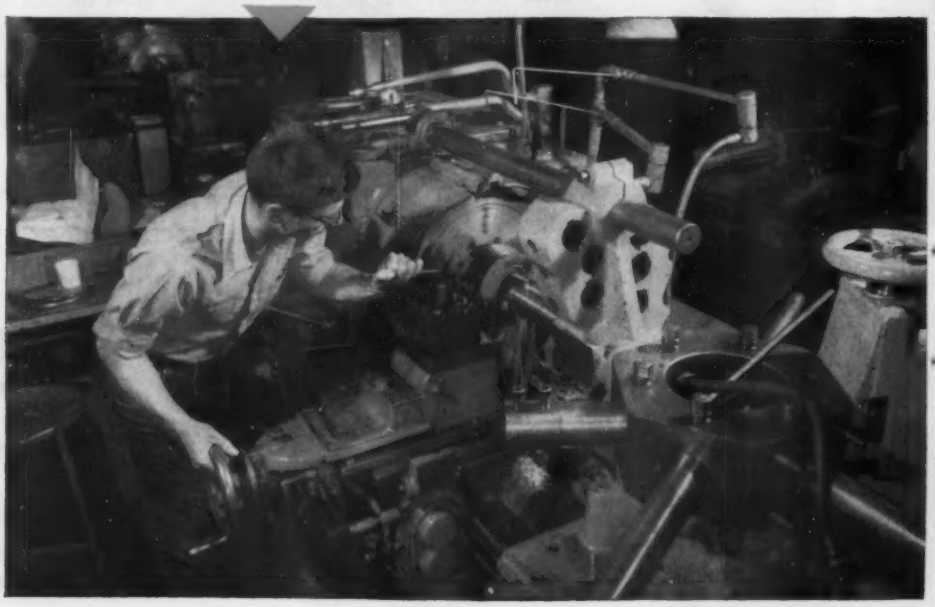
Drilling, Threading, GULF ELECTRO



Mr. E. T. Edvinson, Shop Foreman, and Gulf Sales Engineer Ralph E. Parkhurst check up on the performance of Gulf Electro Cutting Oil in a turret lathe where a spindle for a Cone Automatic Machine is being reamed. Steel is SAE 8620.

Gulf Electro Cutting Oil provides high sulphur activity for this drilling operation where finger holders for Cone Automatics are being formed. Steel is SAE 1045.



or Reaming . . . tests prove CUTTING OIL *BEST*

at Cone Automatic Machine Company, Windsor, Vermont

A lineup of Cone Automatic Machines is readied for shipment. Note the Gulf Rust Preventive being sprayed on vital parts for protection during shipment. Tests in this plant proved the superiority of Gulf Electro Cutting Oil in drilling, threading, and reaming with many types of steel.

"We tried a number of cutting oils over a period of years before we settled on Gulf Electro for jobs that require a sulphurized fluid," says Mr. E. T. Edvinson, Cone Shop Foreman. "Gulf Electro Cutting Oil delivers the best results for us, and has contributed to longer tool life and greater production."

Here's why Gulf Electro Cutting Oil performs better on the jobs for which is is recommended: Thanks to a special Gulf process of combining sulphur, it provides greater sulphur activity over the entire range of a cutting operation. This means better protection for the tool and a smoother machining operation.

Let a Gulf Sales Engineer help you discover opportunities to put Gulf Electro Cutting Oil to work—profitably—in your shop. Write, wire, or phone your nearest Gulf office.

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NEW
GREAVES
TOOLMAKERS OVERARM

Here's the way to add new "firepower" to toolroom milling operations! Install in your toolroom a GREAVES MILL equipped with this new Toolmakers Overarm.

You'll discover new versatility for milling intricate jig and fixture work, for keywaying, slotting and angular milling. Two graduated swivels permit mounting the spindle head in almost any angle for milling, drilling, spot facing and related operations.

Powered by an independent 2 HP motor, the unit is driven through helical gears. Eight speeds may be selected with convenient controls operating speed change clutches. A hand-fed quill attachment provides 4" tool travel to the spindle. Arbor support fits overarm, permits arbor type milling without changing overarm.

Write for Complete Specifications and Prices

- Swivels permit any angular setting of spindle head.
- 2 HP Independent motor drive.
- 8 speeds from 175 to 1750 RPM.
- Quill has 4" hand feed.
- Spindle equipped with No. 50 N. S. taper; reduced to No. 2 Morse taper when Quill Attachment is used.
- Gears run in oil bath.
- Full vision oil level gauge.

RACK FEED. The overarm is equipped with rack feed for positioning over work.

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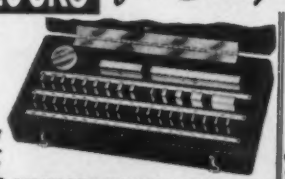

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American Society of Tool Engineers

FRANK W. WILSON,
Editor-in-Chief

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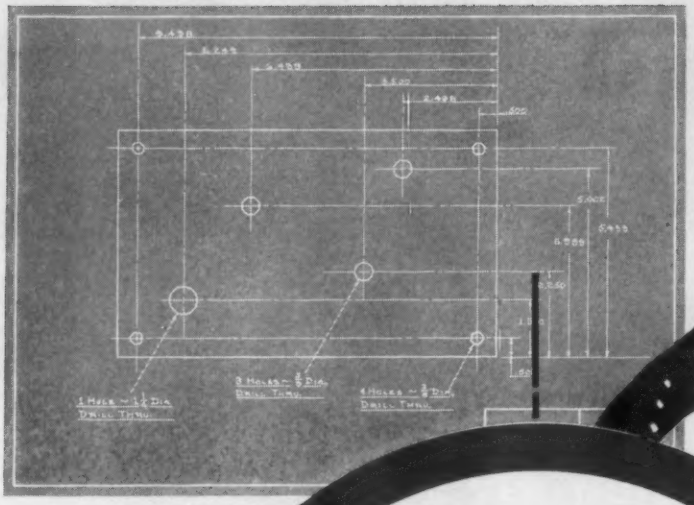
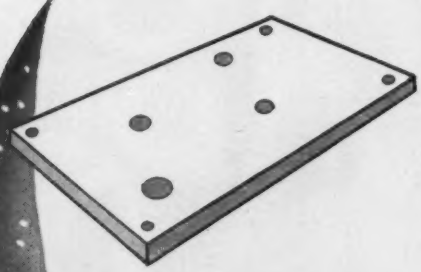


this tape will save you $ thousands per year

the ARTER JIGMATIC



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From blueprint to finished piece — it's all in the tape! Your engineering department punches the tape for desired hole locations. All your operator need do is push the "Position" button, then drill the holes. Costly set-up time is practically eliminated. There are no jigs or fixtures; no stops to set. Savings in set-up time alone amount to thousands of dollars per year.

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– keeps the selected torque setting indefinitely

– prolongs clutch jaw life.

– disengages the instant the fastener is run to desired tightness.

– eliminates stripped threads, sheared fasteners, surface damages.

– prolongs service life of screw bits.

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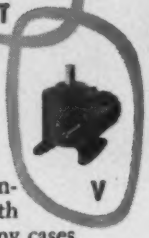
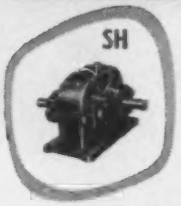
Grant Speed Reducers

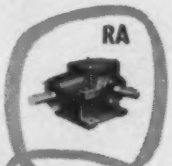


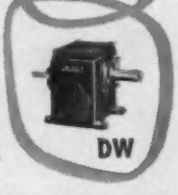
YOUR ASSURANCE OF BETTER PERFORMANCE



The *real* criterion for reduction units is unfailing performance over the years, with minimum maintenance. Our files show many cases where Grant Reducers are still providing every-day service, after two decades, without a breakdown.

What's back of such performance? Extra-quality features built into each Reducer, by gear experts . . . totally enclosed cast iron housings, radial thrust ball bearings, precision high-test bronze gears and worms of chrome vanadium steel. These features mean money in your pocket through trouble-free operation.





Grant manufactures a complete range of types and sizes — worm, double worm, compound worm and spur, helical and mitre gear — with reductions up to 3660-1 — most available from stock. Write for the latest catalog, describing each type in detail.

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SPEED REDUCERS

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Fairview, Bergen County, N. J.
Manufacturers of Ash Conveyor Systems and Pneumatic Systems for handling granular materials.

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Users everywhere report similar experiences. In fact, on 67 machining tests in 11 large machine shops, castings of gray iron treated with FERROCARBO averaged *89.5%* greater machinability per tool than untreated castings. These premium castings are finer-grained, denser, stronger, yet they COST YOU NO MORE... because your foundryman, using FERROCARBO, makes worthwhile savings in raw material costs.

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Using powder metal, pinions are now made in only 12 operations where formerly 22 operations were needed. One stroke of the hydraulic Multipress smooths, burnishes and strengthens the sintered surfaces. The operator has only to load pieces on the Denison Dial Feed Accessory which indexes them into position under the ram.

The Denison hydraulic Multipress improves production efficiency on countless applications where powder metal is used. Have a Denison Hydraulic Engineer study your operations and show where Denison can save you money. Write . . .

THE
DENISON ENGINEERING COMPANY
1164 Dublin Road, Columbus 16, Ohio

DENISON HydrOILics

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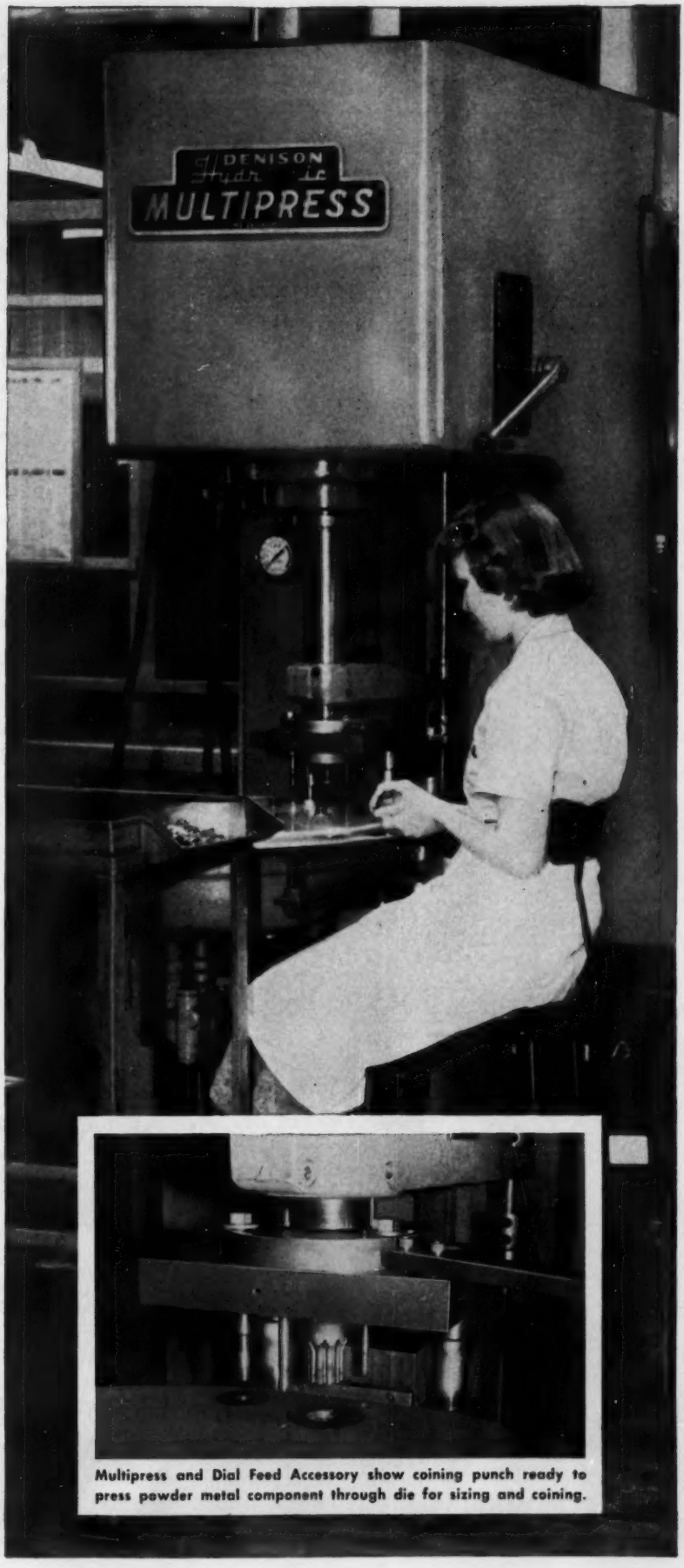


Multipress and Dial Feed Accessory show coining punch ready to press powder metal component through die for sizing and coining.

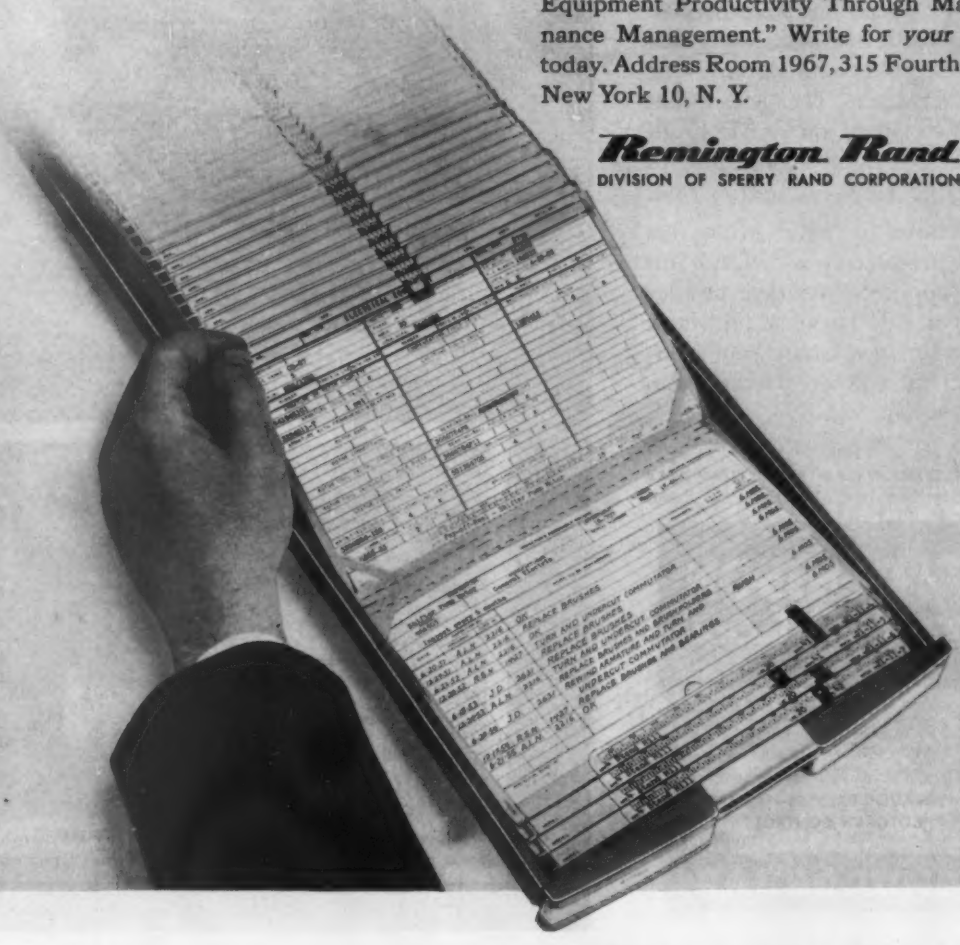
Let's Talk About Productive Maintenance

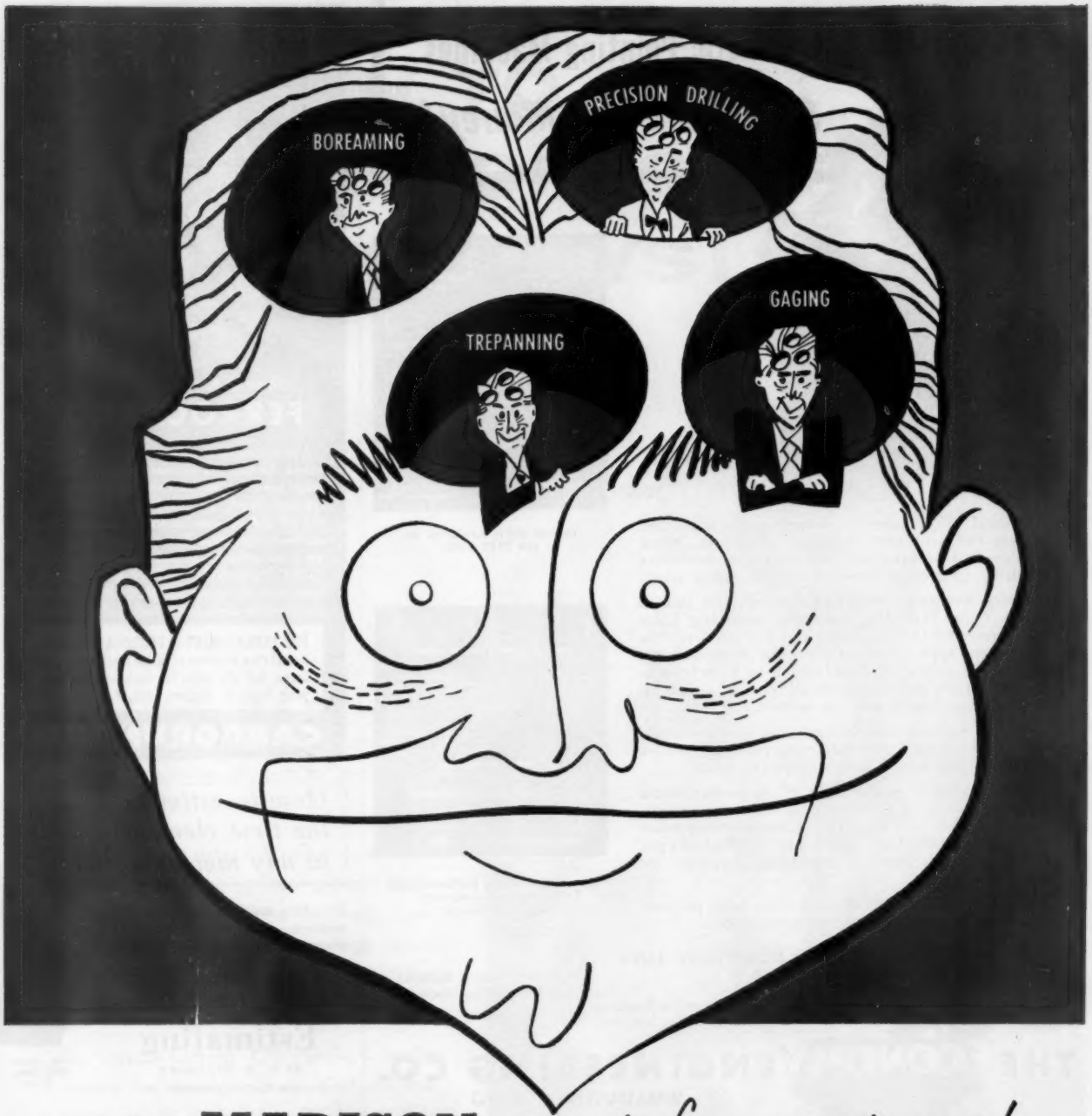
The ideal basis for any productive maintenance program is Remington Rand Kardex. Remington Rand Kardex combines in a single, accessible record complete information about each machine — characteristics, frequency of repairs, maintenance service and costs. Colored Kardlok signals let you review your entire program in a matter of moments, providing quick, effective, "locked-in" control.

In addition, Kardex is the ideal record for spare parts inventory control. An effective stores control system is indispensable to preventive maintenance. Without proper inventory control of replacement parts, valuable production will be lost and machine down time greatly increased.

Both these applications of Kardex are discussed in FREE booklet X1383, "Assured Equipment Productivity Through Maintenance Management." Write for *your* copy today. Address Room 1967, 315 Fourth Ave., New York 10, N. Y.

Remington Rand
DIVISION OF SPERRY RAND CORPORATION





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The "hole" problem of the machine tool builder calls for an *unbiased answer* when selecting the *proper tool* for the *most efficient performance* of their machines. For this reason, the four-in-one Madison man is the one most frequently called upon to recommend the best tool for the job. He can logically pinpoint *your* needs because he has a tool to fit every hole-making application whether it's boring, precision drilling, trepanning or gaging. The broad knowledge and experience of your Madison man lowers hole costs through savings in time and money. Besides full production economy, you get better finish with greater accuracy. Submit your problem to "the men with holes in their heads."

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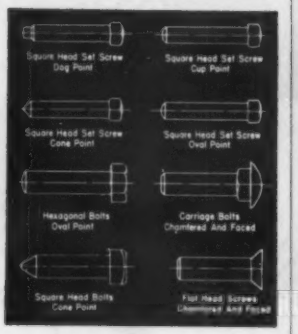
ECONOMY Automatic Pointing Machines

Save Time and Money!

TYPE 3300


Square Head Set Screw Dog Point
Square Head Set Screw Cup Point
Square Head Set Screw Cone Point
Square Head Set Screw Oval Point
Hexagonal Bolts Oval Point
Carriage Bolts Chamfered And Faced
Square Head Bolts Cone Point
Flat Head Screws Chamfered And Faced

Typical parts machined on the TYPE 3300

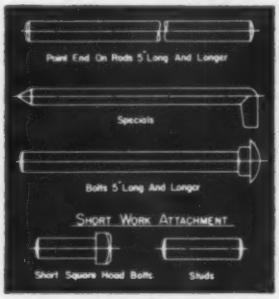
ECONOMY Automatic Pointing Machines are hopper fed and automatic in operation. These features enable operator to run several machines resulting in greater productivity and lower costs.

These Automatic Pointers are available in two sizes—Type 3300 for uniformly pointing bolts and screws to 3/8" diameter and 3/4" to 3-1/2" in length, the type 4600 for pointing bolts and cap screws 1/4" to 3/4" diameter and 1" to 6" in length. A single machine will handle all types of points on many types of bolts and cap screws.

Production rates of the type 3300 vary infinitely from 2,000 to 6,000 finished parts per hour and on the type 4600 from 1800 to 5400 per hour.

Also available is the type "P" Semi-Automatic Pointing Machine for pointing bolts, cap screws, studs and rods 1/4" to 1-1/2" diameter, 5" or more in length. Production rates up to 2,000 pieces per hour make it a valuable secondary machine for short runs.

Consult ECONOMY on low cost, high production Bolt and Screw Pointing operations.



Typical operations performed on TYPE "P" Semi-Automatic Pointing Machines

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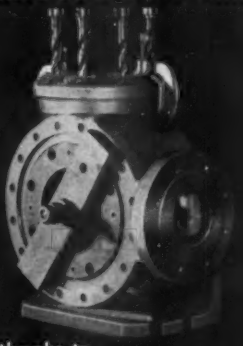

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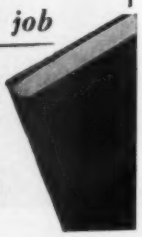

Use this manual to make the winning but safe bids that mean more jobs and better profits for your shop.

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BY W. A. NORDHOFF
Douglas Aircraft Company, Inc.

486 pages, 486 Illus., $7.00

Here's the kind of on-the-job help you need to make quick, reliable estimates of the time it takes to do the different machining operations in any machine-shop, large or small. Whether a job involves drilling, boring, tapping, threading, grinding—or any of the scores of other operations—this handy manual tells you exactly what to consider in estimating job-time.

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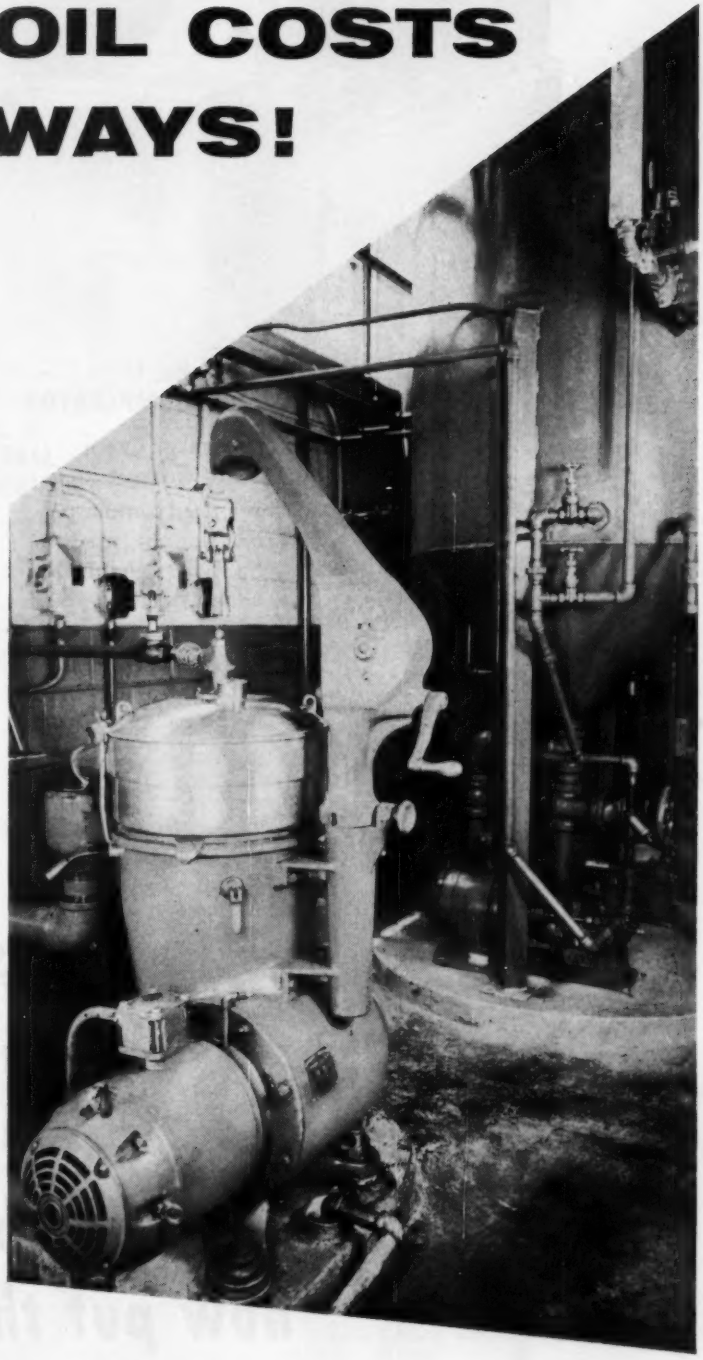

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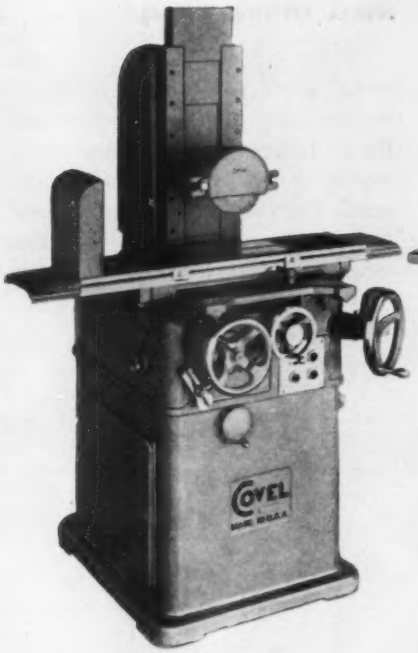

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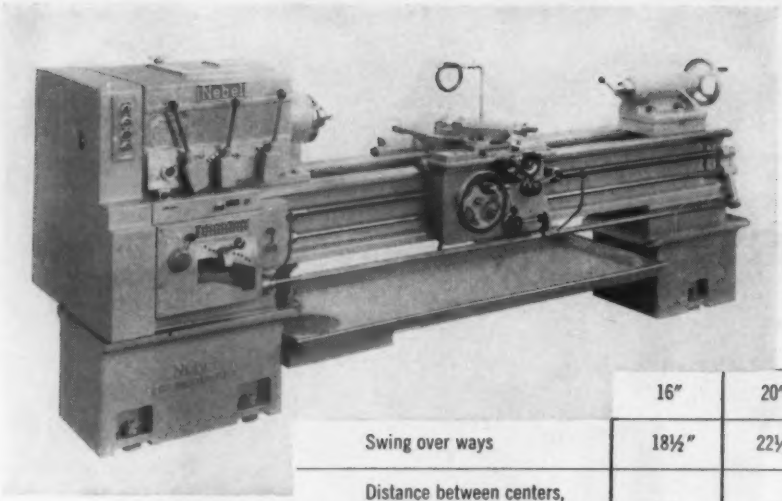


NEBEL ENGINE LATHES

Nebel gives you more economical engine lathe turning . . . because these lathes aren't loaded with expensive extras you may never need. Yet you may add any accessory or extra equipment you know you'll be using. Nebel fills your requirements exactly.

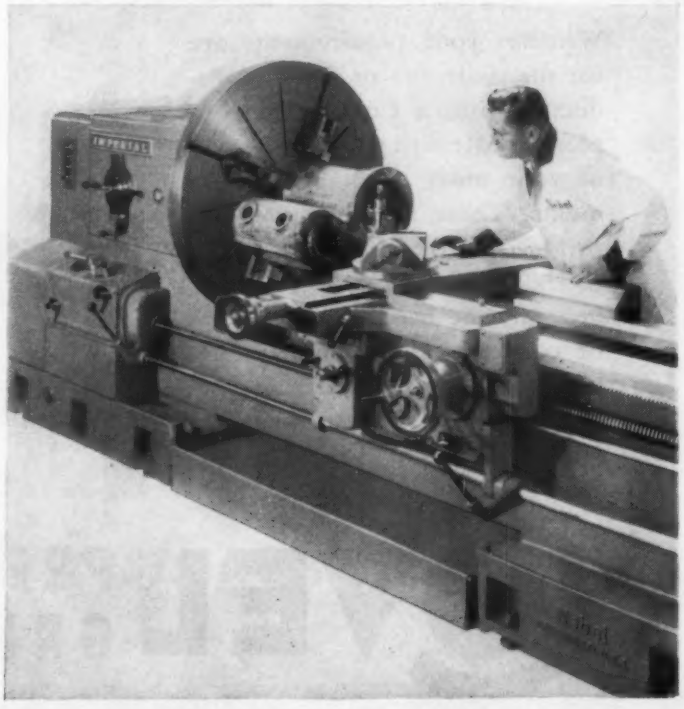
	16″	20″	25″	27″	32″	36″
Swing over ways	18½″	22½″	27″	29″	33½″	37½″
Distance between centers, minimum bed	24″	24″	58″	50″	48″	48″
Spindle speeds, standard, number	12	12	12	12	12	12
Spindle speeds, standard, range	13-400	10-320	9-280	5-230	5-230	5-230
Motor recommended, hp	5-7½-10	5-7½-10	10-15	15-20	15-20	15-20

NEBEL LATHES: your best

NEBEL EXTENSION BED GAP LATHES

The all-new 20″/40″ Imperial (right) offers plenty of speed, power, capacity, performance and weight, yet is several hundred dollars lower in price than its nearest competitor. Also made in 28″/50″ size.

A Nebel extension bed gap lathe, with its variable swing capacity and distance between centers, outperforms two standard lathes . . . yet requires the floor space of but one lathe . . . and you make but one investment for this doubly useful, dual purpose lathe.



	20″/40″	28″/50″
Swing over ways	24½″	29″
Swing thru gap	42″	52″
Width of gap, minimum bed	32″	41″
Spindle speeds, number	18	12
Spindle speeds, range, rpm	11-666	5-230
Motor recommended, hp	15-20	15-20-25

NEBEL REMOVABLE BLOCK GAP LATHES

Here's a double lathe value: standard engine lathe turning . . . plus the bonus of as much as 51% additional swing capacity. Yet they cost only a few dollars more than an equivalent size engine lathe.

	16″/27″	20″/30″	25″/40″
Swing over ways	18½″	22½″	27″
Swing thru gap	27½″	31½″	41″
Width of gap	15″	15″	22½″
Distance between centers, minimum bed	24″	24″	58″
Motor recommended, hp.	5-7½-10	5-7½-10	10-15

investment in metal turning

Nebel lathes – modern, up-to-date, smartly designed, built by craftsmen – are the most economical metalworking lathes on the market today. Continuously improved for over 56 years, they'll give you top performance today and tomorrow.

Made in three different models – engine, removable block gap and extension bed gap – and in swing sizes from 16″ to 50″ – there's a size and type for all your requirements.

When you use Nebel lathes, you're in good company, because they're used extensively by the aviation industry and for the jet engine program. They're ideal for production and maintenance. They're used at sea by the U. S. Navy and merchant marine. They meet or exceed ASTE standards and they measure up to government specifications for atomic energy and other projects.

You'll be time and money ahead to check Nebel first. For complete information including prices and deliveries, call your Nebel distributor, or write Nebel Machine Tool Corp., Cincinnati 25, O. Use convenient coupon below to obtain descriptive Nebel bulletins.

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NEBEL MACHINE TOOL CORP.
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Gentlemen: Please send me at once and without obligation descriptive free bulletins in sizes and types indicated:

Size

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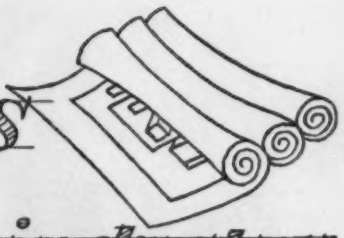
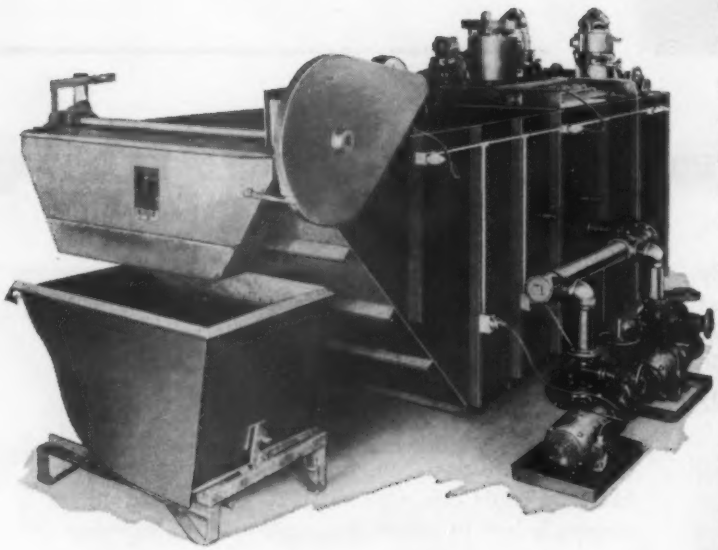


KEEP COOLANTS CLEANER • REDUCE WHEEL DRESSING
CUT COSTS WITH A HOFFMAN FLOTATION SYSTEM



If your plant is a volume user of soluble oil and water coolants—20 gallons or more—there's money for you in Hoffman coolant clarification systems.

The Hoffman fully automatic, unattended flotation unit is connected to every machine sump, collects coolant after it flows *once* over the work—removes every trace of grit, muck, or chips—and returns it to the coolant supply.

Cutting tools stay sharp, and grinding wheels stay clean longer, work faster and closer, and there is far less down time for maintenance. Coolant replacement practically disappears. *Production increases!*

In the Hoffman clarifier, an exclusive aeration-flotation system lifts the "fines" to the top in froth. Mechanical skimmers carry this foam into settling tank where solids settle to the bottom. The sludge is dragged up an incline for drainage, and is discharged in near-dry state.

To learn how much dollar return your plant can get through Hoffman coolant clarification . . . and through other industrial filtration systems . . . write for technical bulletins and a Hoffman Filtration Engineer's survey. No obligation.

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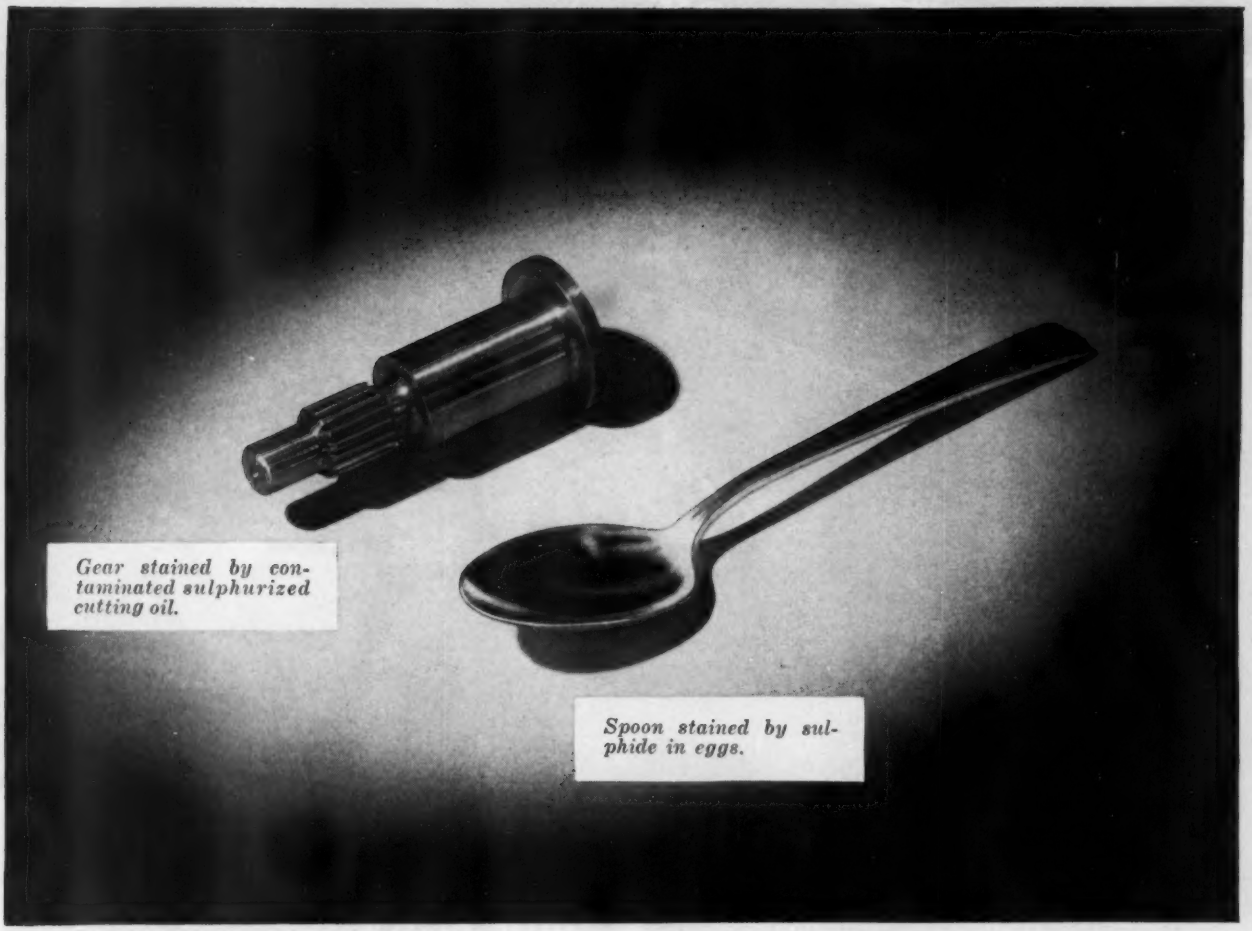

Gear stained by contaminated sulphurized cutting oil.

Spoon stained by sulphide in eggs.

Sulphur Staining on Ferrous Parts is Harmless

Staining of machined ferrous parts caused by cutting fluids containing active sulphur is similar to the stains you find on your silverware. It has no adverse effects whatsoever on the finish, or characteristics of the metal. *It is not corrosion*, and according to automotive and military authorities, in no way affects service life.

Experience has proved that cutting fluids containing active sulphur provide far better performance when machining the tougher steels. Staining can only occur during very humid conditions or when water is allowed to contaminate the sulphurized cutting oil. A sample piece of metal will not stain in a cutting fluid free of water . . . but often it will the moment moisture is added.

The *important* factors to consider when selecting a cutting fluid are surface finish, production and tool life. Here is where a cutting fluid pays for itself. Ask to have "the Man in the Barrel", your Stuart Representative, help select that Stuart Oil that will produce the very best results under the conditions you will subject it to.

Further information on sulphur staining is provided in the D. A. Stuart Shop Note Book, Bulletin S-1. Write for your copy.

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Specially selected sizes for the small shop or a standby set where additional blocks are a needed convenience.

Keep a second set with wanted sizes available on instant notice. Avoids delay or even error that might result from using substitute gaging methods.

The 43 Block Set (43 B) has accuracy of ± .000008" and must pass the same test for surface finish, flatness and parallelism of the finest grade of steel blocks.

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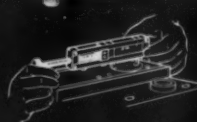
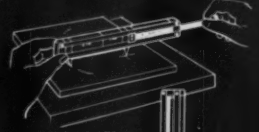
If you use gage blocks you'll want the time saving convenience of this accessory set. It simplifies gaging by enabling you to apply the blocks directly to the work as a snap and plug gage, height gage, scriber and trammell. The set includes 4 gage block holders, base, straight and round jaws, centerpoint and scriber.





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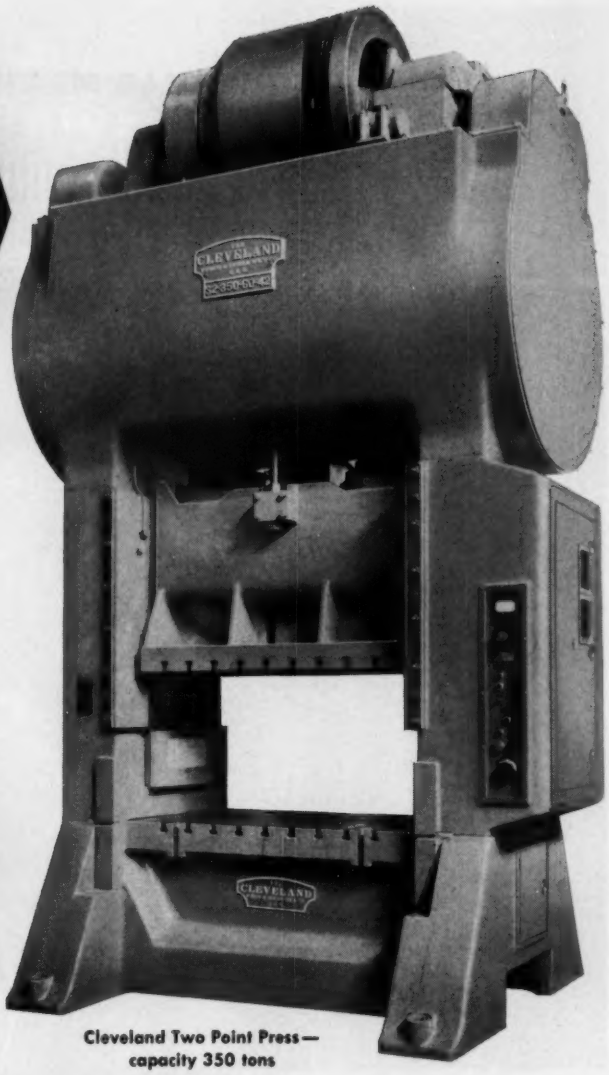

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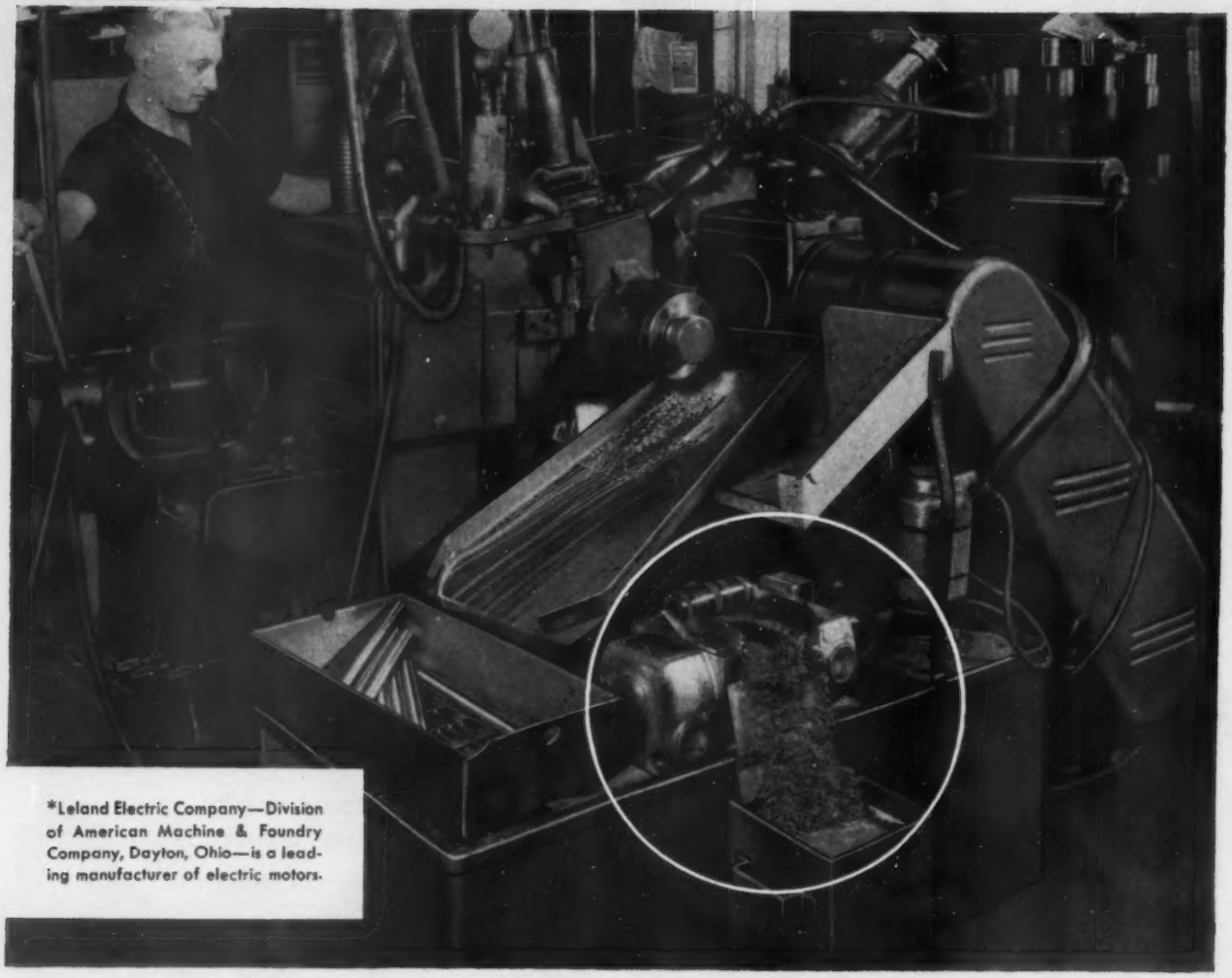

*Leland Electric Company—Division of American Machine & Foundry Company, Dayton, Ohio—is a leading manufacturer of electric motors.

● Coolant contamination is no longer a problem in Leland Electric's armature shaft grinding department.

Five Houdaille Magnetic Separators—mounted on grinder sumps—provide machines with a constant supply of clean coolant. Separator shown above removes 62 pounds of metallic chips and sludge daily.

Annual savings in coolant and maintenance costs total $2230. Other benefits include longer wheel life, better product finish, more sanitary working conditions.

The Houdaille Magnetic Separator is designed for complete removal of ferrous metal chips and abrasives. Compact, lightweight, easy to install. Uses no floor space, needs no separate pump and motor. 10, 20, 40 GPM capacities. Write for Equipment Bulletin 601 and 4-page Leland case history.

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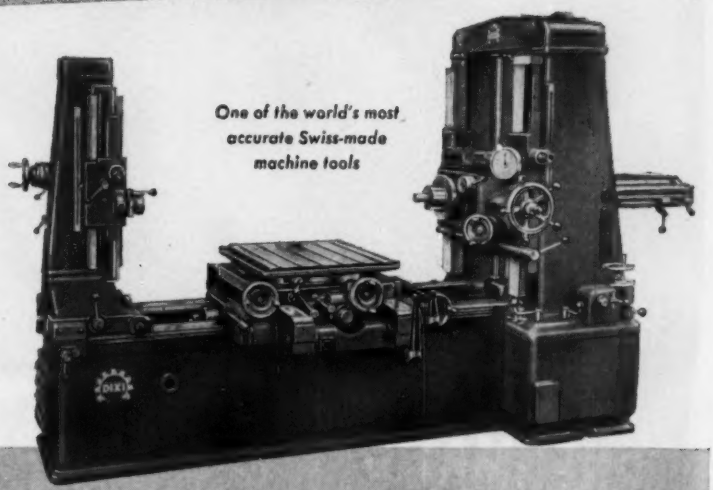
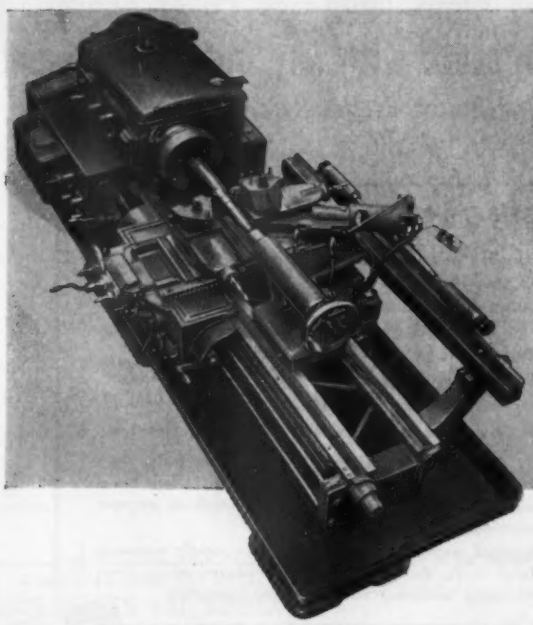
No. 40 taper spindle. Spindle speeds 32-1350 R.P.M. Feeds .0015"—.010" per rev. Table size 28¾" x 32⅝" max. distance spindle to table 19¾". Table travel 23⅝". Spindle travel 24.4".



One of the world's most accurate Swiss-made machine tools



Heavy Duty Lathe ***High Precision, Reliability, Top Performance Schaerer Model UN-450***

Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permit rough turning and finish turning in the same operation in many instances. Swings 17¾" over bed, 9" over carriage, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M.

Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pump. A production lathe built to tool room standards.

- *Guaranteed Service by Trained Staff*
- *Engineering Staff will make recommendations based on your requirements*
- *Spare parts in Stock*
- *Your Operators Trained*
- *Early Deliveries — Some from Stock*
- *Competitive Prices*
- *Financing and Rental Plans to Meet Your Requirements*

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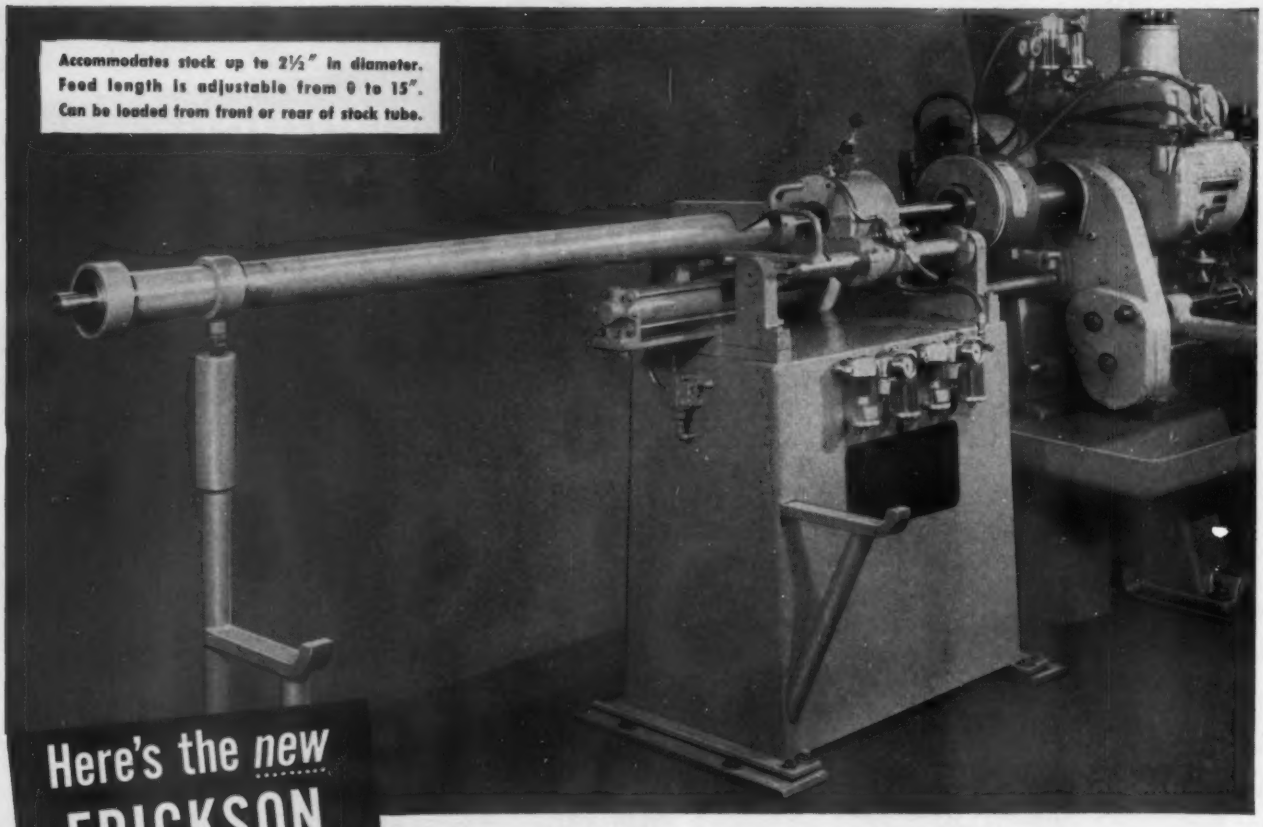

Accommodates stock up to 2½" in diameter.
Feed length is adjustable from 0 to 15".
Can be loaded from front or rear of stock tube.

Here's the *new* ERICKSON PNEUMATIC BAR FEED!

...An Automatic Air Stock Feed and Collet Operating Unit Designed to Operate with any Collet Equipment

• *Increases production* • *Reduces operator fatigue*

THIS NEW ERICKSON Stock Feed automatically feeds bar, hex or tubing stock to your machine tools for rotating or non-rotating machining operations. It is an air-powered, fully automatic unit which is quiet, simple to operate, safe to use, rugged and dependable. It can be used with any type of collet equipment.

EASE OF OPERATION reduces operator fatigue and speeds set-up cycle time. One valve controls entire operation. At a flick of the valve handle, spindle collet opens and feed chuck advances stock to preset length; feed chuck then opens its jaws. Another flick closes spindle collet on stock and returns feed chuck to its starting position where it closes its jaws on stock to give double grip.

AA-916

OPERATIONAL ADVANTAGES

- Assures positive movement of stock. No dragback of stock on return stroke.
- Adjustable feed chuck jaw pressure eliminates marring or crushing of stock while providing positive grip.
- Permits use of exact size, polished stock.
- Provides double grip on stock to resist "pushback".
- Stock feed is adjustable to suit cycle time and bar size.
- Stock moves with spindle rotating to reduce cycle time.
- No safety controls needed due to basic design.
- Filler tube is supported over its length by ball bearings in stock tube. It rotates with stock to prevent marring, eliminate chatter.
- Rugged welded base construction rigidly supports feed chuck, dampens vibration, reduces whip, guaranteeing smoother finishes, quiet operation.

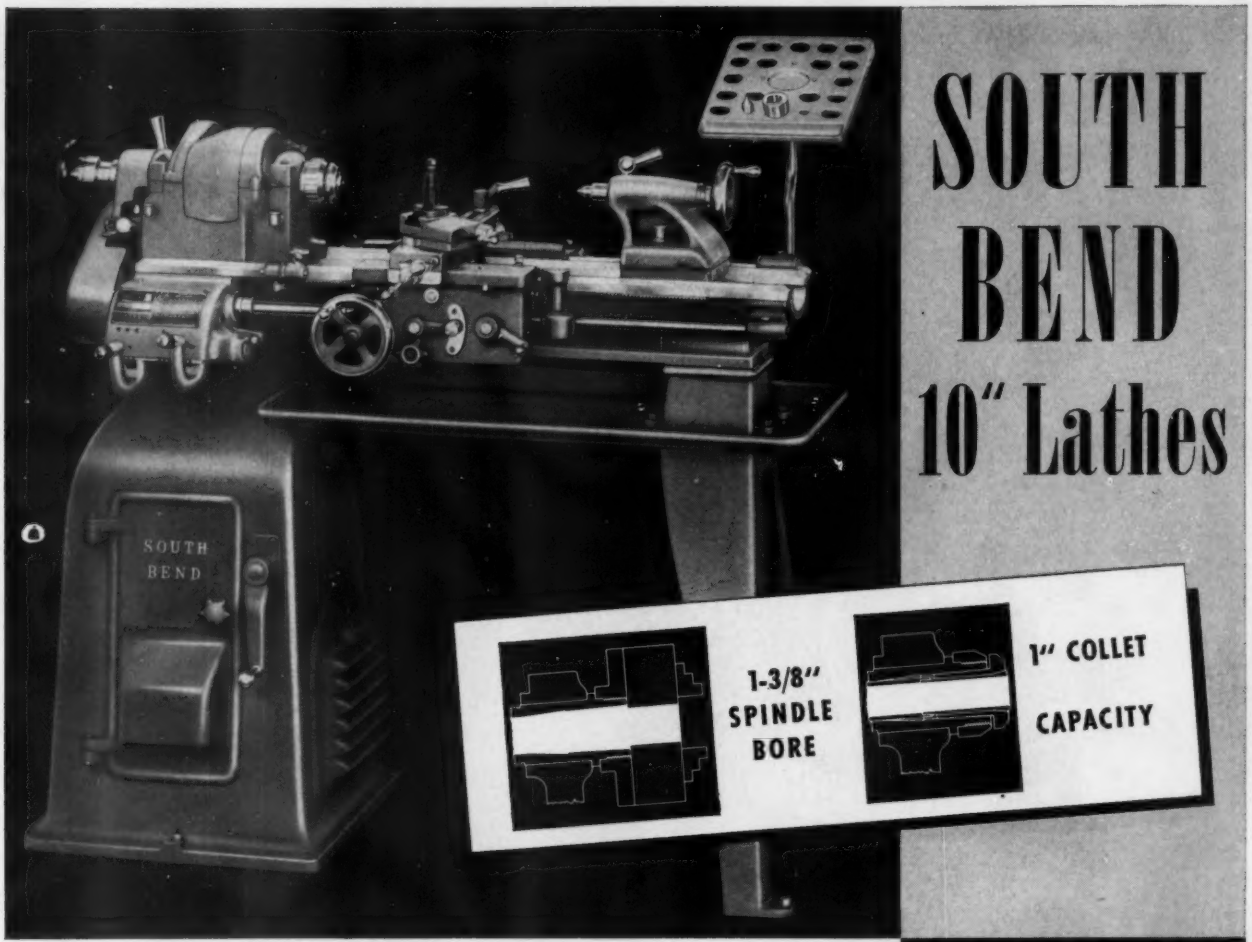
For complete information on the new Erickson Pneumatic Bar Feed, send for your copy of Circular K-2 today!

Erickson Holding Tools — Guaranteed Accuracy

ERICKSON TOOL COMPANY

2309-9 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES



SOUTH BEND 10" Lathes

10" *Precision* TOOLROOM LATHE

Sound design, expert workmanship and quality materials give the 10" South Bend Lathe the dependable performance you want. Equipped with a precision lead screw, thread dial indicator and thread cutting stop, you can use it with confidence for cutting screw threads, making precision gauges or turning out instrument parts.

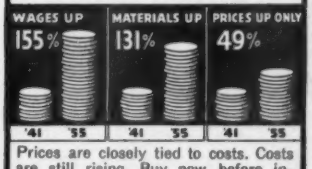
Another outstanding feature is the 1" collet capacity and 1-3/8" spindle bore which is built on the same design and specifications of larger lathes. The large spindle bore gives you big lathe collet capacity in a small, compact unit.

You will like the way this lathe cuts idle time . . . reduces costs . . . releases big lathes for heavy work. Write for catalog *today*.

SPECIFICATIONS

SWING 10⅛" over bed and saddle wings, 5¾" over cross slide.
COLLET CAPACITY.....1 in.
SPINDLE BORE.....1⅜ in.
BED LENGTHS....3, 3½, 4 ft.
CENTER DISTANCES...14¼ in. to 26 7/8 inches.
SPINDLE SPEEDS...(12) 55 to 1400 r.p.m., approximately.
POWER LONGITUDINAL FEEDS 70 R.H. or L.H....0007" to .0836".
POWER CROSS-FEEDS 70.... .0003" to .0303".
THREAD CUTTING 70 R.H. or L.H. pitches, 4 to 480 per inch.
MODELS Quick Change Gear and Toolroom, bench and floor type.

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941



Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES ☐ 10" to 16-24" FLOOR LATHES ☐ DRILL PRESSES ☐ ½" & 1" Collet TURRET LATHES ☐ TOOL GRINDERS ☐ 7" BENCH SHAPERS

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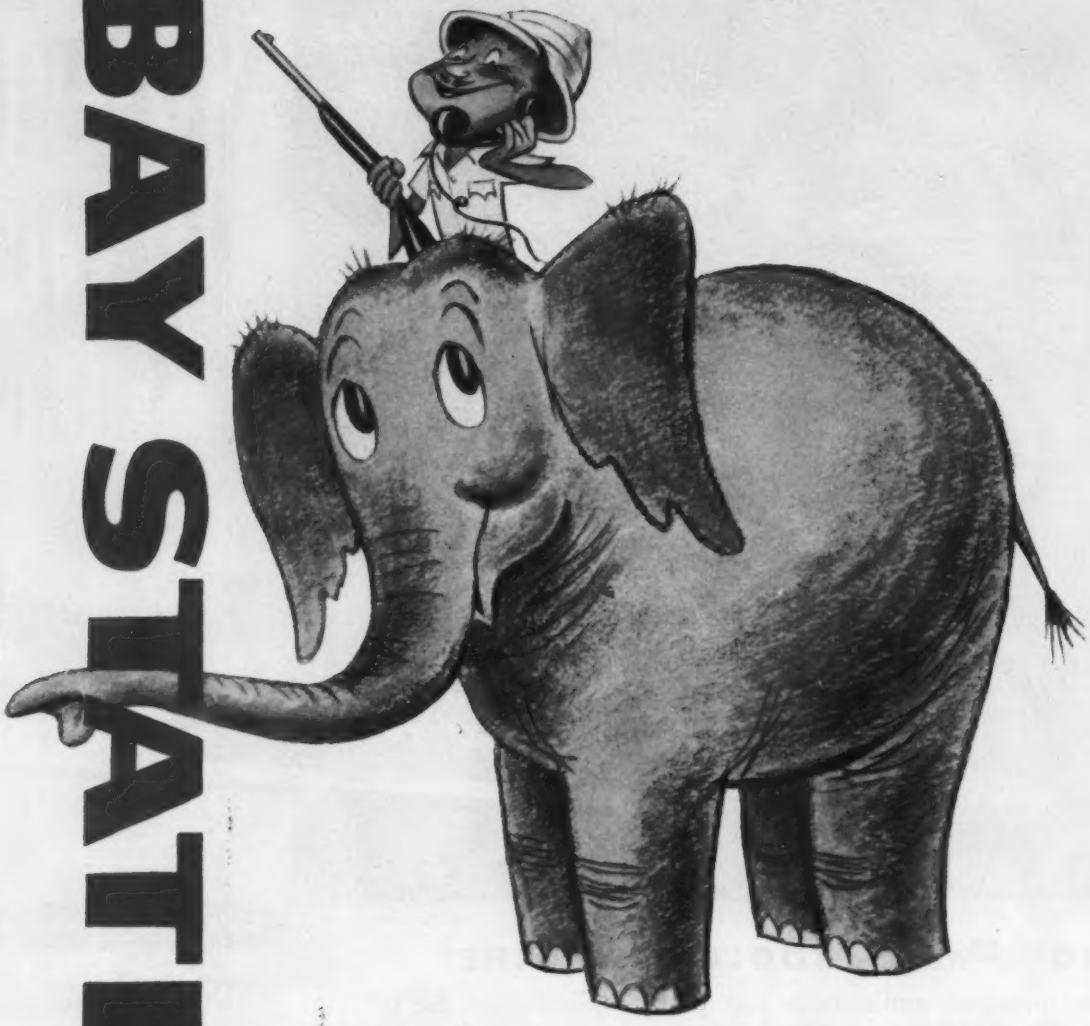
Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

BAY STATE TAPS

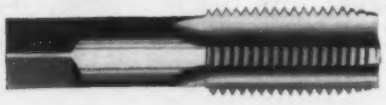


WHEREVER YOU ARE

when you need taps . . .

call your Bay State Distributor . . .

he keeps your tapping costs low, production high by stocking the BAY STATE PRECISION PERFORMANCE TAPS which you need . . . and he will deliver them when you need them. BAY STATE TAP & DIE COMPANY



MANSFIELD, MASSACHUSETTS

THOMAS J. WATSON, JR. *Portrait by Fabian Bachrach*

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"I have always been proud of the fact that IBM was one of the first companies to put into effect the Payroll Savings Plan for the purchase of United States Savings Bonds, and I am delighted to see this patriotic endeavor continuing year by year and increasing throughout our organization. Today thousands of IBM employees, through their participation in the Plan, are helping their country and providing for the future of their families and themselves." **THOMAS J. WATSON, JR.,** ***President International Business Machines Corporation***

If employee participation in *your* Payroll Savings Plan is less than 50% . . . or, if *your* employees do not now have the opportunity to build for their future through the systematic purchase of U.S. Savings Bonds . . . a letter to: Savings Bonds Division, U.S. Treasury Department, Washington, D. C., will bring prompt assistance from your State Director. He will be glad to help you put on a person-to-person canvass that will put an application blank in the hands of every employee. This is all you have to do. Your men and women will do the rest, because they will welcome the opportunity to build for personal and national security.

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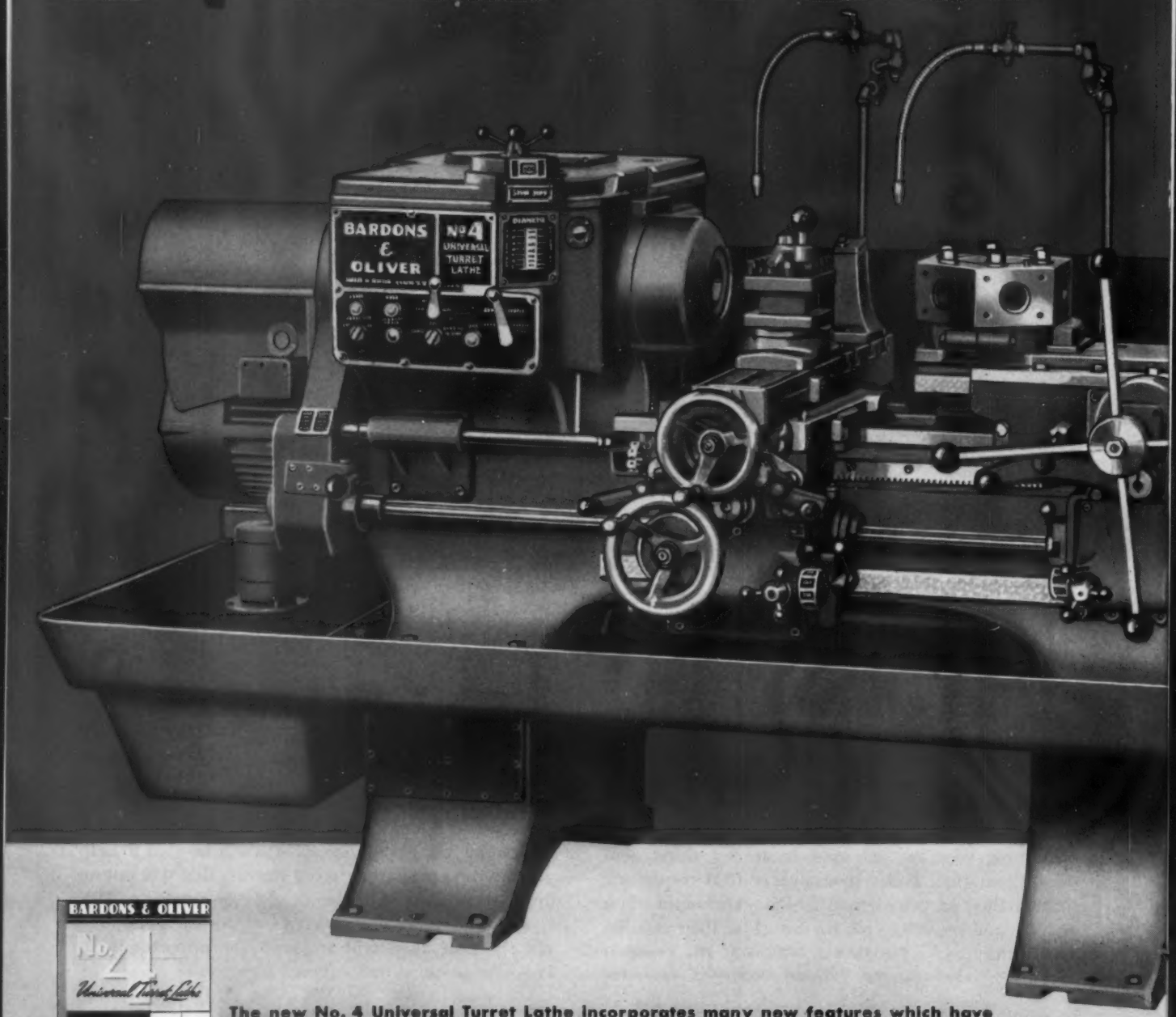
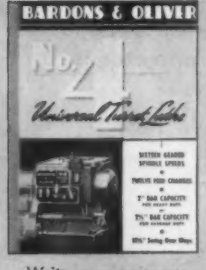
THE NEW BARDONS & OLIVER

No. 4 Universal Turret Lathe...





Write us on your company's letterhead for this new Catalog.

The new No. 4 Universal Turret Lathe incorporates many new features which have sharply increased its productive capacity while lessening the physical effort required of the operator.

A larger selection of spindle speeds, covers a wider overall range. Spindle speeds are instantly preselected and changed. Tool carrying stations have increased rigidity and accuracy. Controls are regrouped for handier and faster manipulation. Wider selection of feeds are provided with positive jaw feed clutches and easier engagement levers.

Power transmitting capacity is adequate to accommodate motors of ample horsepower for the latest developments in cemented carbide tooling.

We welcome the opportunity to quote production estimates on individual requirements.

Features:

- Sixteen Geared Spindle Speeds, providing a fifty to one speed range.
- Three optional spindle speed ranges with maximum up to 2000 R.P.M.
- Constant Horsepower (optional to fifteen) at all spindle speeds.
- Fast operating and effortless Electric Headstock Clutches.
- Fully Automatic Spindle Speed Changing.
- 100% anti-friction bearing headstock and aprons.
- Flanged Type Motor Mounting with reduced overhang.
- Diagonal Cross Ribbing full length of bed and underneath headstock.
- Replaceable Bed Ways of Solid Hardened and Ground Alloy Steel.
- Replaceable Hardened and Ground Steel Turret Slide Saddle Ways, Gibs, and Top Caps.
- Large Hexagon Turret and deep Turret Slide of exceptional accuracy and rigidity.
- Twelve Quick Feed Changes for Cross Slide, Carriage and Hexagon Turret.
- Single Dial Feed Selectors on both Aprons.
- Positive Tooth Feed Clutches with "Easy Action" Engagement Levers.
- Sealed Carriage and Saddle Aprons.
- "One Shot" lubrication of all Tool Slide Ways.
- Accurate and Rigid Square Turret Sealed by Protective Skirt.
- Large Hardened and Ground-in-Thread Ball Bearing Cross Slide Screw.
- Anti-Backlash Adjustable Nut on Cross Slide Screw.
- Built-in Bar Feed Stop providing extra Turret Tool Station.
- Faster Hydraulic Bar Feed and Collet Chuck.
- Only one Bar Feed Setting for a full length of Bar Stock.
- Impeller Type Coolant Pump with Integral Motor Drive.
- Optional Collet Chuck Capacities (2″ or 2½″ diameters).

MANUFACTURERS OF TURRET LATHES AND CUTTING-OFF LATHES

BARDONS & OLIVER, INC.

1134 WEST 9TH STREET • CLEVELAND 13, OHIO

FAMOUS LAST WORDS:

"it may never happen"

True—and let's hope it never does. But the moment when we're least expecting it would be the best moment for an aggressor to attack. And the atom bomb isn't the only emergency that may hit us. Fires, floods, explosions, tornadoes also strike with little or no warning. Be ready for disaster, whatever form it takes. Do these simple things TODAY:

- ☐ **Enlist the help of your local Civil Defense Director.**
- ☐ **Check contents and locations of first-aid kits.**
- ☐ **Send staff to Red Cross courses. They may save your life.**
- ☐ **Promote preparedness in your community. Your local CD Director can show you how.**

Set the standard of preparedness in your plant city—check off these four simple points NOW

(Advertisement)

Talking About Die Sets

WITH

PHIL MARSILIUS

Vice-President
The Producto Machine Co.

Die Springs: Production Bonus or Bottleneck?—It all depends on how you, the user, select them and use them. Die springs fall into three general classifications according to type of wire used—square, oval and round. The type used in a die is determined in the original design and substitution is not easy once the die has been built, since inside and outside diameters, deflection and pressures vary widely among the three types. Great care, therefore, must be taken in the selection to see that the spring will withstand operating conditions. Should the original choice prove incorrect, re-machining of the die to accommodate a different spring type will prove expensive, to say nothing of the costly downtime involved.

Types of Springs—Square wire springs are usually made from high carbon steel and used where a maximum load rate and a normal travel are required. They are best suited to *short* production runs since the forming operation for them and the square cross-section are more apt to result in failure when used for any great length of time.

Oval wire springs are available in three load ratings—30%, 37% and 50% deflection—and in two types of steel, high carbon and electric furnace chrome-vanadium. They are increasing in popularity because their design tends to eliminate failures resulting from structural strains and weak points. Carbon springs of this type are suitable for most applications and can be run for considerable time before failure. Chrome-vanadium springs, while slightly higher-priced, more or less guarantee performance for at least three times longer than carbon steel springs. When extreme economy is not a factor, best performance and reduced downtime are practically insured by use of chrome-vanadium.

Round wire springs are not generally suitable for die applications because of the difficulty of obtaining proper travel and load ratings for the standard sizes.

Hints on Proper Use—Even the best spring can fail if improperly used. Here are a few hints: 1. Springs should be sufficiently supported in a hole or over a rod or stripper bolt to guide the spring adequately under stress. Lack of support can result in crushing, twisting, binding or surface wear on even the best springs; 2. When altering spring lengths by cutting and grinding, care should be taken to prevent excess heat generation which causes spring to lose its temper; 3. For springs set in holes, squaring the bottom of the hole to give a flat seat is an added safeguard toward longer life; 4. Do not deflect springs beyond the recommended limits for the speed of operation.

To prevent die breakage and reduce downtime, your best protection is proper spring selection.

THIS SPECIAL LATHE PUTS PRECISION INTO YOUR DIE SET AT EVERY TURN

Putting precision into a Producto die set begins on semi-steel sets with the turning of the shank and top and bottom surfaces on Producto-built lathes like the one above. These high-speed production lathes are *100% automatic* in function. A gang of cutting tools, preset for each die set size, automatically turns the shank to diameter and length and faces off the top of each punch holder. Next, a companion lathe a few feet away faces the bottom.

Pieces Finish-Ground

The operator loads and unloads the machine and, after checking the shank against standards, drops the piece onto a conveyor which carries it down to the Blanchard grinders. There the bottom is ground for extra precision. Finally, the piece is checked for parallelism and thickness on highly accurate granite surface plates. Die beds go through a similar procedure. Rejects are rare.

Precision Machined In

Long experience in designing and building special machinery enables Producto to construct equipment that *machines precision into its die sets at high speed.* This mass-production technique, which almost eliminates human error, is another reason why you can depend on Producto for consistent accuracy in every die set. For precision die sets fast, call your nearest Producto branch.

THE PRODUCTO MACHINE COMPANY
975 Housatonic Avenue, Bridgeport 1, Connecticut
Telephone FOrest 7-8675

For prompt die set service, 'phone these PRODUCTO assembly warehouses:

Atlanta	CY 7667	Detroit	LI 6-7600	Philadelphia	MO 4-1010
Chicago	ES 8-3307	Kansas City	VI 1162	Rochester	GL 1810
Cleveland	SU 1-6158	Los Angeles	TR 9826	St. Louis	FR 3370
Dayton	MU 1651	New York	WO 4-7484		

or check the Yellow Pages in any stamping center in the United States or Canada for distributors stocking PRODUCTO.

Produce More With

PRODUCTO

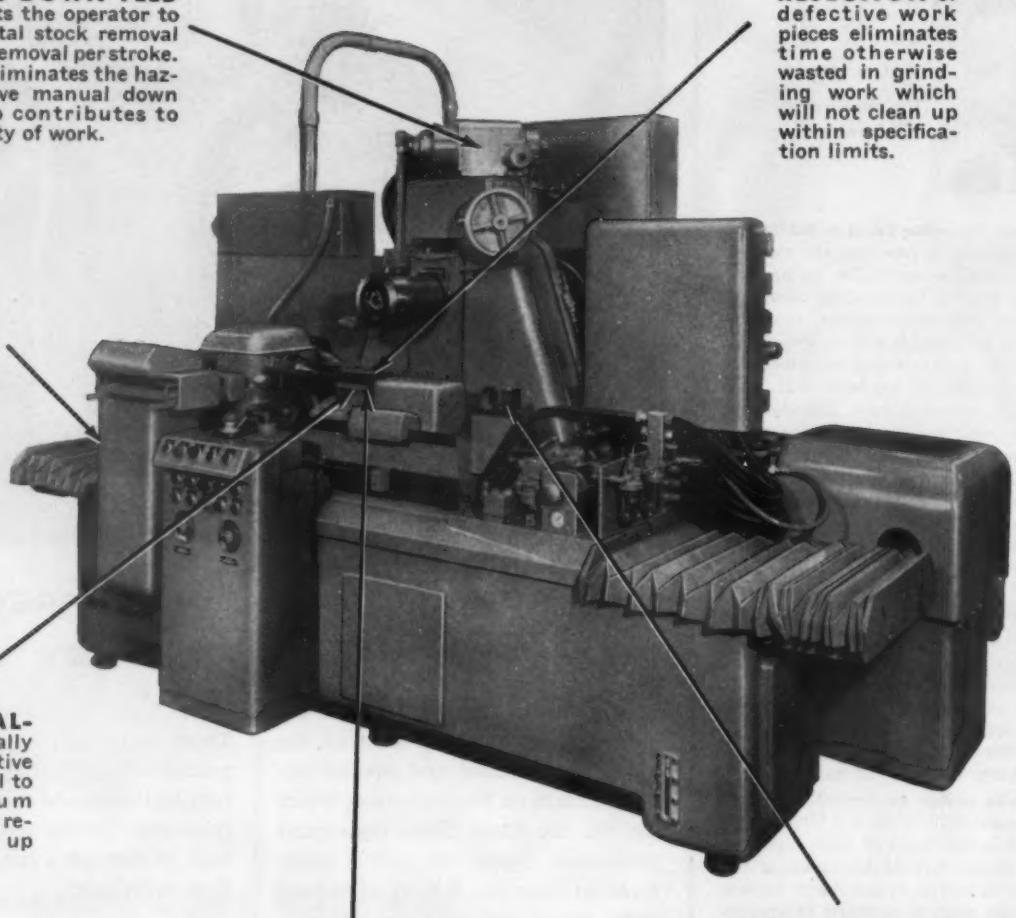
Precision Die Sets

PRODUCTO

AUTOMATIC DOWN FEED control permits the operator to pre-set the total stock removal and the stock removal per stroke. This feature eliminates the hazard of excessive manual down feed and also contributes to uniform quality of work.

AUTOMATIC REJECTION of defective work pieces eliminates time otherwise wasted in grinding work which will not clean up within specification limits.

AUTOMATIC LOADING of the work pieces. The machine can be hopper fed or magazine loaded, as desired.

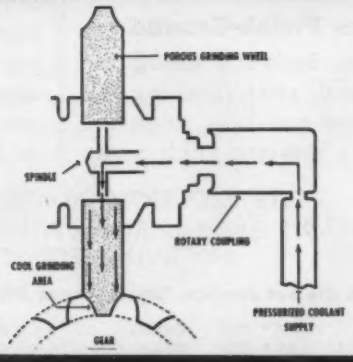


STOCK EQUALIZER automatically locates work relative to grinding wheel to assure minimum stock removal required to clean up the teeth.

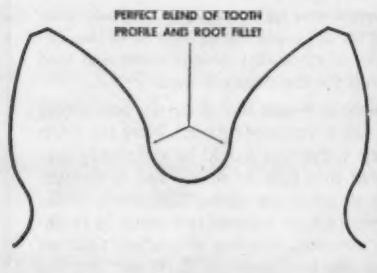
AUTOMATIC RELEASE of work pieces after grinding completes the automatic cycle.

AUTOMATIC TRIMMING of the grinding wheel assures uniformly accurate work. The complete working cycle is automatically controlled.

These 5 improved Features Insure Quality and Production



1 NON-TEMPERED, CASE-HARDENED PARTS. A controlled flow of coolant through the grinding wheel is supplied to the working area between the grinding wheel and the gear tooth. This feature, coupled with the automatic down feed, virtually eliminates the causes of surface tempering and checking during grinding. By eliminating surface tempering, the allowable surface stress of case-hardened gears can be increased tremendously without encountering pitting or scoring.



2 PERFECT BLENDING OF FILLET & PROFILE. Single or double diamond trimmers are used to assure a perfect blend between the tooth profile and the root fillet. Other methods of dressing the wheel result in irregularities at the critical section of the tooth which act as stress risers and frequently cause unnecessary tooth breakage.

INTRODUCED AT THE MACHINE TOOL SHOW...

The FIRST Fully Automatic Gear Grinding Machine in Industry

The development of fully automatic gear grinding machines has been in progress for 10 years at the Gear Grinding Machine Company. They are the product of over 45 years experience in manufacturing gear machines and gears. And here is what these new machines mean to you—the gear manufacturer.

Fine Quality Gears at High Production Rates

These new Geargrind Automatics offer the advantage of producing highly accurate, fully hardened gears at increased production rates. Whatever your gearing application—in job lots or production quantities—you'll save valuable time and decrease the need for skilled operators.

All of these advanced automatic features have been thoroughly tested in long production runs—they are ready to work for you whether your gearing needs are simple or complex. They are available on any of the complete line of gear grinding machines.

FULLY Automatic Gear Grinding Machines for • Internal and External Gears and Splines • Specially Contoured Parts

FOR MORE INFORMATION ON *Fully* Automatic GEAR GRINDING MACHINES—WRITE TODAY

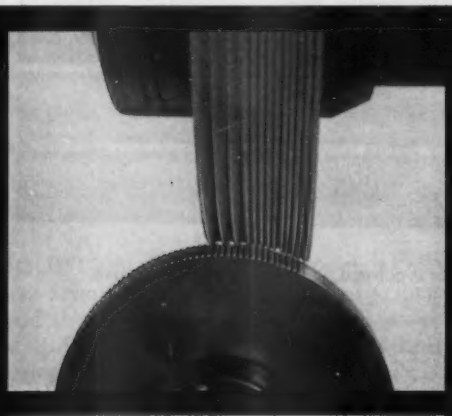
Here is a new 8-page brochure on all 11 of the revolutionary advanced features available on today's Geargrind Automatics. Write or phone now—we'll send it immediately.

THE GEAR GRINDING MACHINE CO.

3919 CHRISTOPHER • DETROIT 11, MICHIGAN

Manufacturers of:

THE DETROIT SCREWMATIC 750 • RZEPPA (pronounced "Sheppa") CONSTANT VELOCITY UNIVERSAL JOINTS



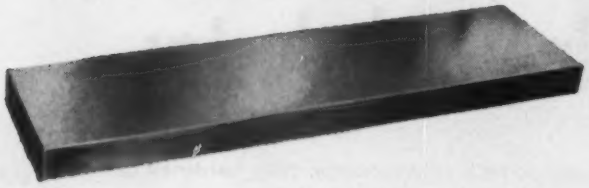
3 MULTI-RIBBED GRINDING WHEEL increases the production rate by increasing the number of teeth being ground simultaneously. The number of wheels or ribs that can be used is dependent upon the work being ground. In actual tests, efficiency has been increased over 150%.

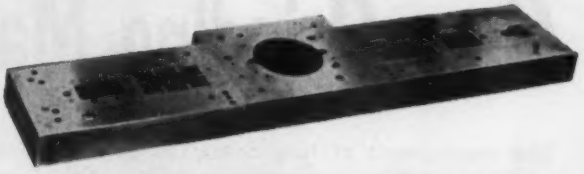
4 MULTIPLE FIXED DIAMOND TRIMMERS are used to virtually eliminate grinding wheel dressing time and increase high production. The wheels are simply fed down and then passed directly through the diamonds.

5 TIME RECORDER is provided which accumulates the total machine cycle time for production control.

How to Know BEFORE DELIVERY

What Results You'll Get from the TOOL AND DIE STEELS You Order





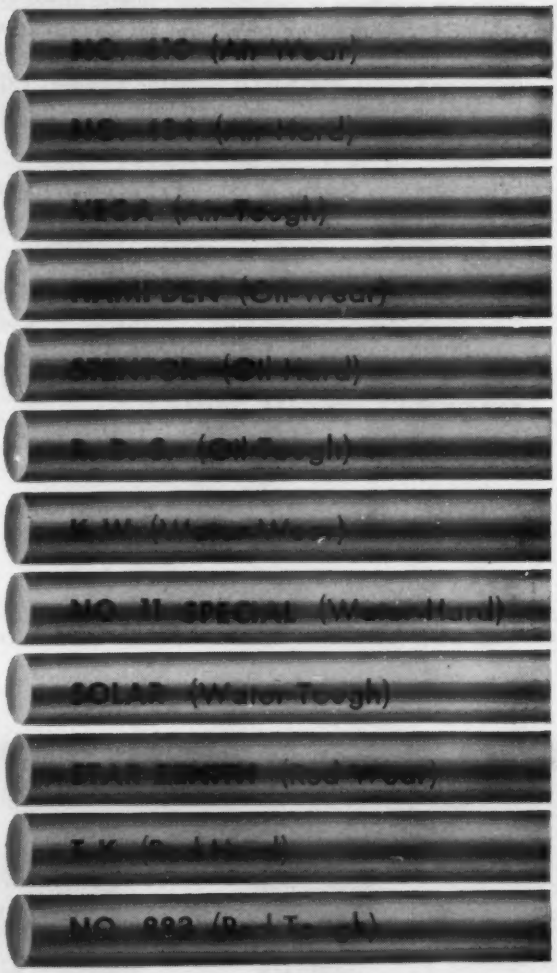
Maximum performance from your tools and dies is possible *only* when your design, toolmaking and heat treating are backed by sound, top quality tool and die steels. You control the first *three factors*. But how can you be sure, *before delivery*, that the die steels you order will deliver the *results* you want?

To give you this assurance, Carpenter puts its "mark" on *every* grade of die steel it produces. This mark, or brand name, is the sign of *consistent Carpenter quality*.

In back of it, at Carpenter, is a long list of painstaking controls. These include Hot Acid Etch Inspection, Ultrasonic Testing, Tough Timbre and Hardenability Testing. And that's only the start of many *extras* you get with Carpenter brands of tool and die steels . . . extras that enable you to predict *in advance* results you'll get on the job!

Accurate selection is one example. With the Carpenter-pioneered Matched Set Method your men take the guesswork from choosing the one steel best suited to the job. *Trouble-free heat treating* is another. Through tests and controls, Carpenter has simplified the heat treatment of Matched Tool and Die Steels beyond anything previously known. Further, a wealth of printed information gives you a "blueprint" to minimize costly heat treating hazards.

All this . . . and more, stands behind every bar of Carpenter Matched Tool and Die Steel. So, when you see any of these Carpenter brand names, you can feel *safe* in the knowledge you're getting *full value* from your investment. Specify Carpenter Matched Tool and Die Steels. It costs you no more to be *sure!*



And each bar is colored *full length* with a distinctive color for each grade. Here's *positive* identification!

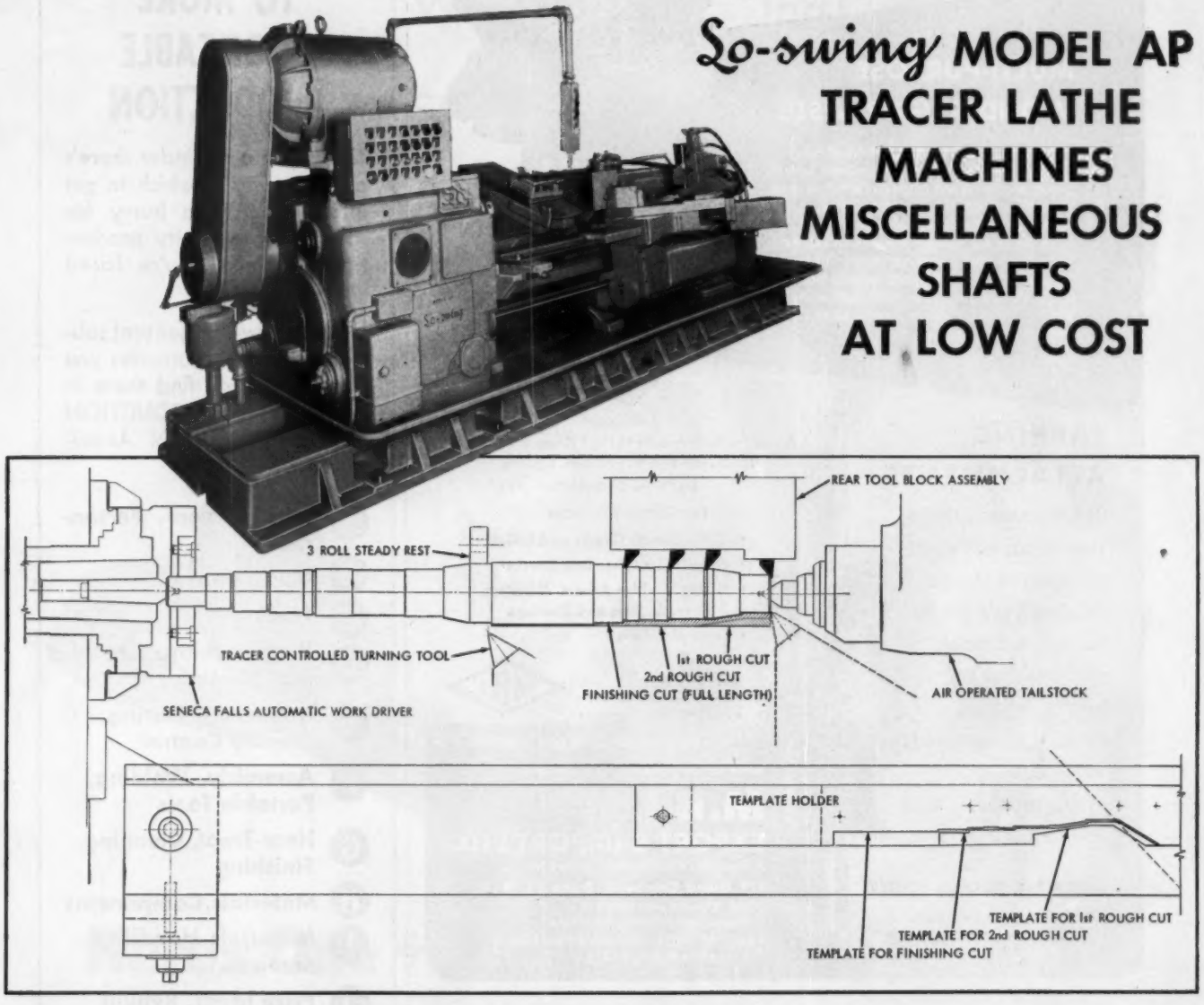
Carpenter STEEL — Matched Tool and Die Steels

Export Department: The Carpenter Steel Co., Port Washington, N.Y.—"CARSTEELCO"
THE CARPENTER STEEL CO., 109 W. Bern St., Reading, Pa.
Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U.S.A. and Canada

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

Lo-swing MODEL AP TRACER LATHE MACHINES MISCELLANEOUS SHAFTS AT LOW COST



PROBLEM: To rough and finish turn, face shoulders and undercut miscellaneous shafts automatically in medium and small sized lots.

SOLUTION: A Lo-swing Model AP Tracer Type Lathe was recommended for this job because of ease of setup and the fact that this high speed machine can be operated by semi-skilled labor. A simple type of master template reproduces size and profile of the shaft.

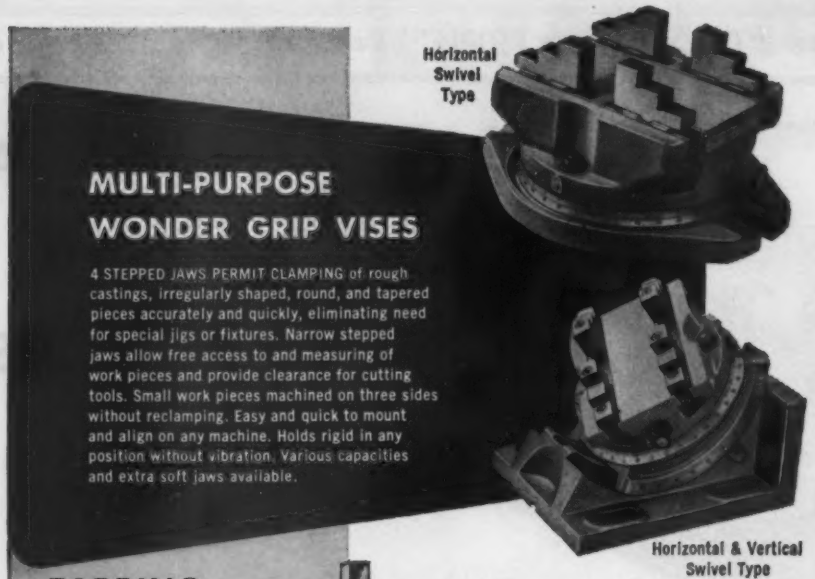
Rough shafts arrive at the machine centered and are hand loaded by placing one end in the Work Driver and resting the other end on the Work Cradle. The machine cycle is fully automatic and provides automatic change-over from rough to semi-finished and finished turning. The operator pushes the starting button and the tail-stock center advances, the machine starts and the tracer controlled tool rough turns, semi-finish turns and finish turns the diameters shown on the line drawing. The undercuts are made with tools mounted on the back squaring attachment. On completion of the turning operation, the carriage automatically returns to the starting position and the spindle stops.

Longitudinal feed is by rack and pinion, permitting unlimited carriage travel up to the full bed length. The Back Attachment feed cycle is synchronized with the movement of the front tracer-type carriage and requires no attention.

Let Seneca Falls engineers help solve your production turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing



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HERE'S YOUR CONSTANT INDEX TO MORE PROFITABLE PRODUCTION

This is just a reminder there's an easy way in which to get information in a hurry for solving those knotty production problems you're faced with daily.

Listed below is a general subject index to the answers you need, as you'll find them in your 1955 PRODUCTION PLANBOOK issue of *American Machinist.*

- **A** Management, Personnel
- **B** Machining
- **C** Tooling
- **D** Pressworking, Molding, Casting
- **E** Inspection, Testing, Quality Control
- **F** Assembly, Welding, Portable Tools
- **G** Heat-Treat, Cleaning, Finishing
- **H** Materials, Components
- **I** Materials Handling, Services
- **J** Prize Ideas, Rebuilt Equipment

And that's not all. An integral part of these ten sections are hundreds of informative advertisements . . . a list of manufacturers offering free product literature . . . and an alphabetic listing of products and services advertised in the PLANBOOK.

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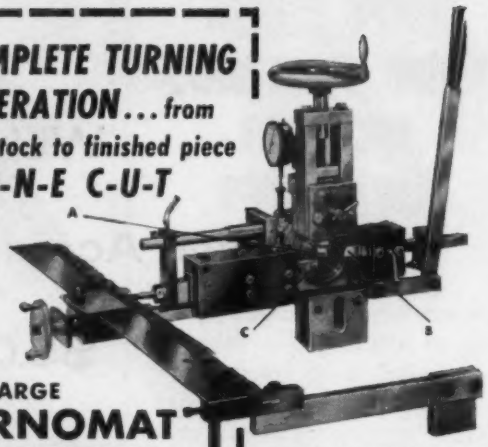

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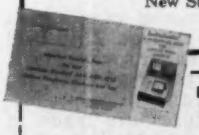

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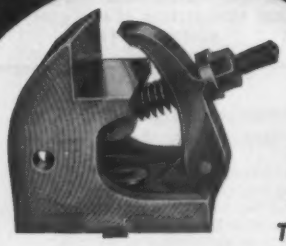

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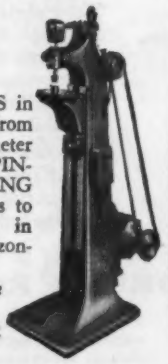

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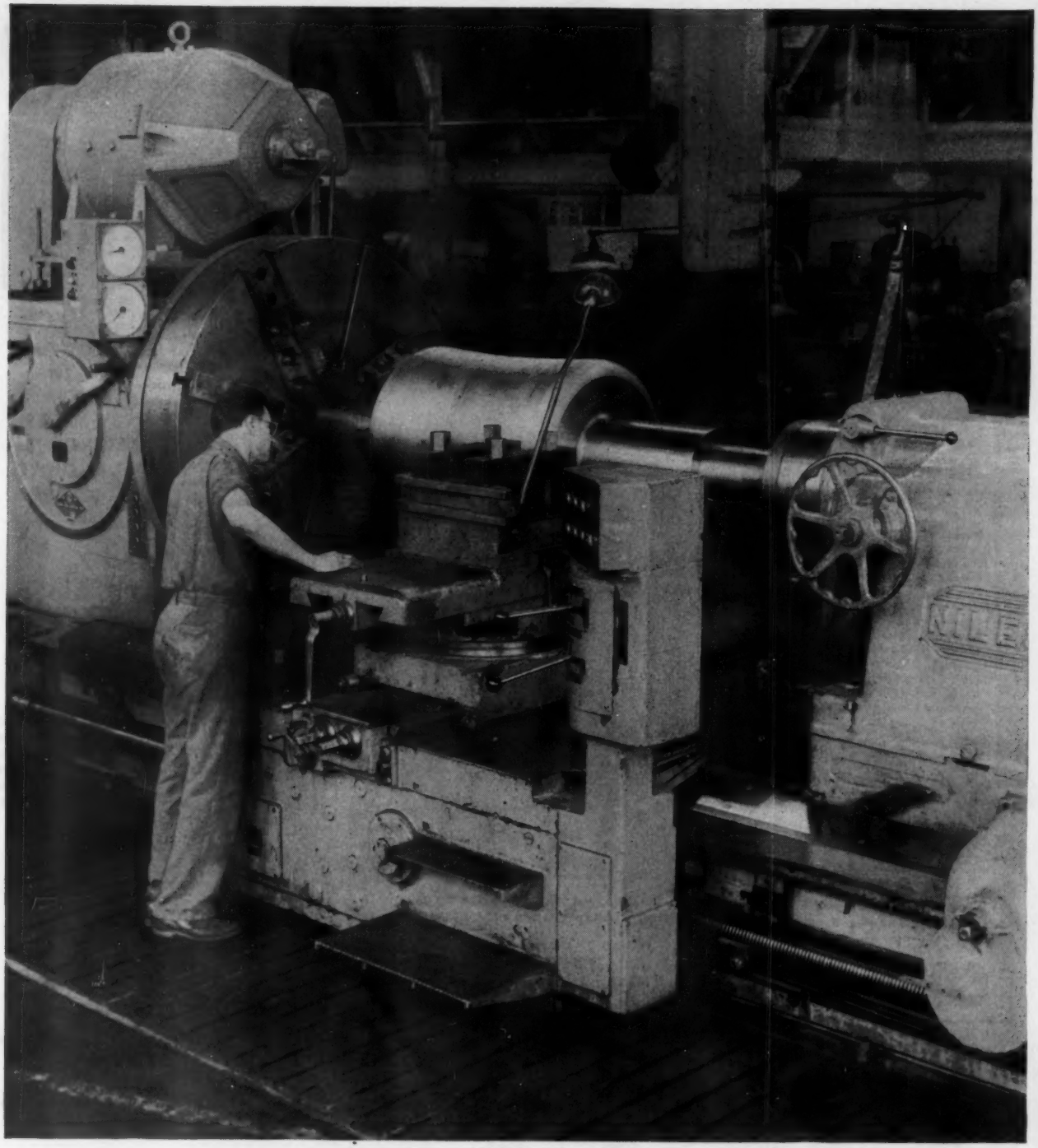

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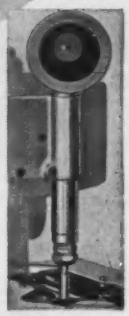

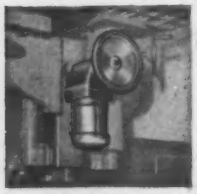

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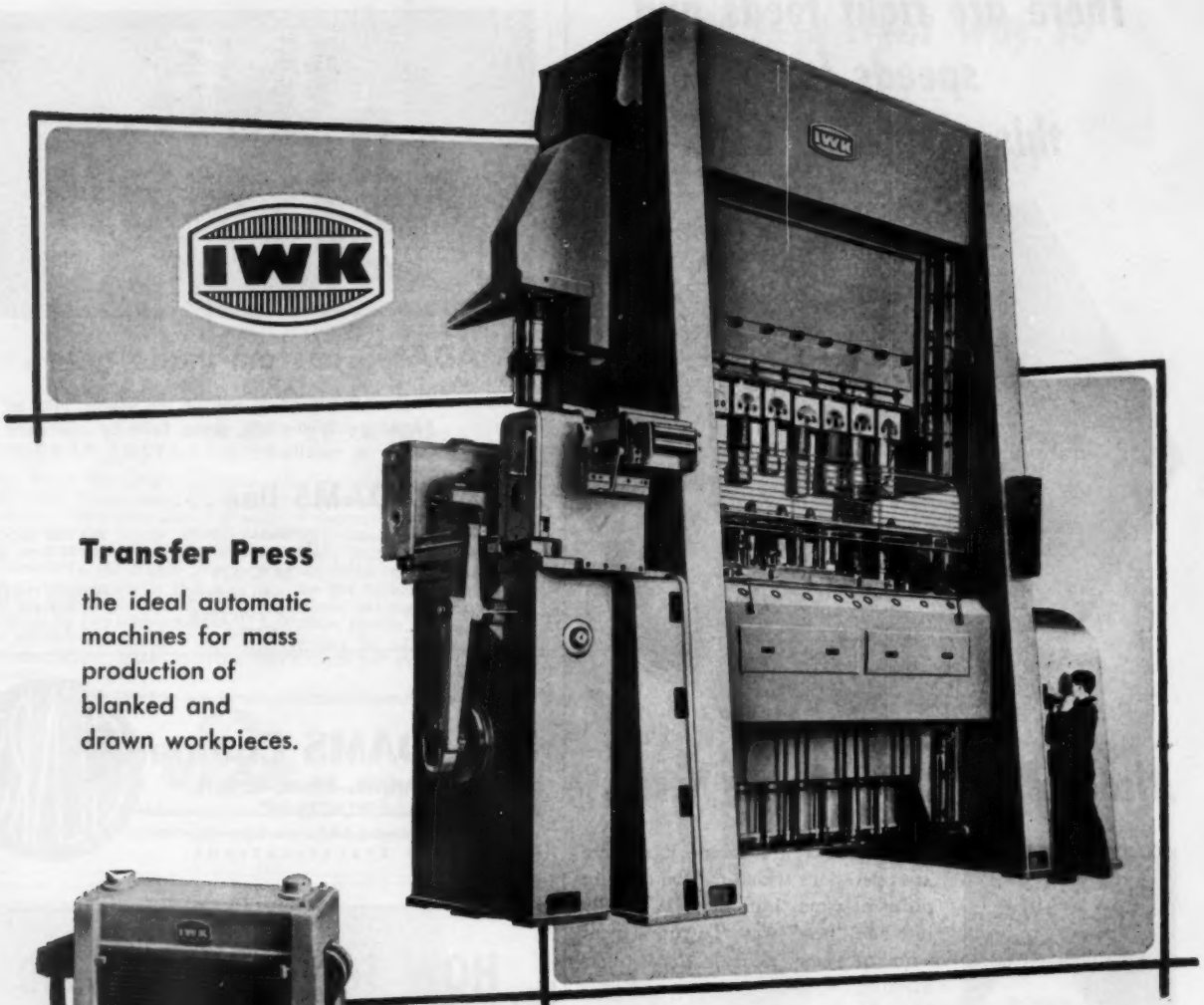

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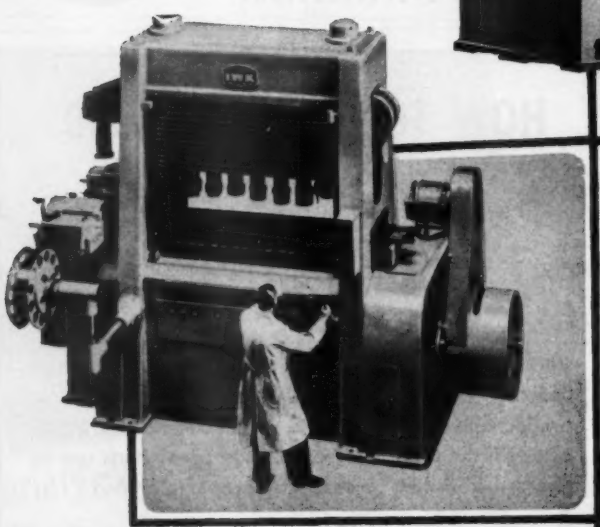

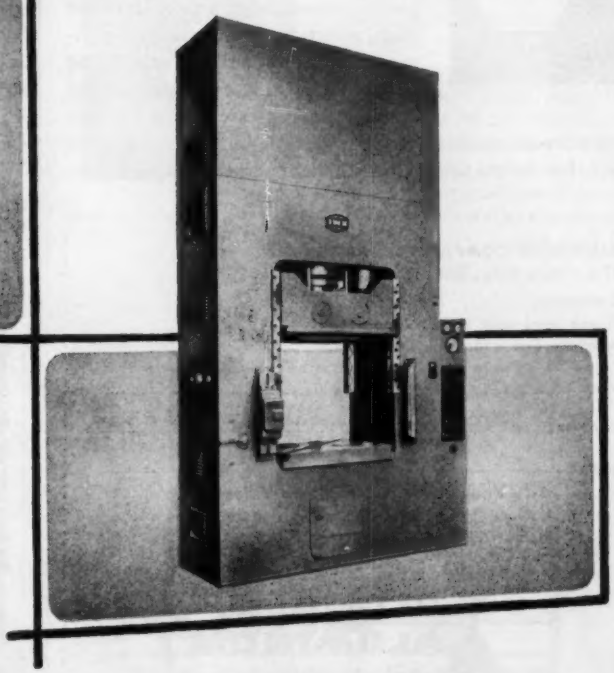

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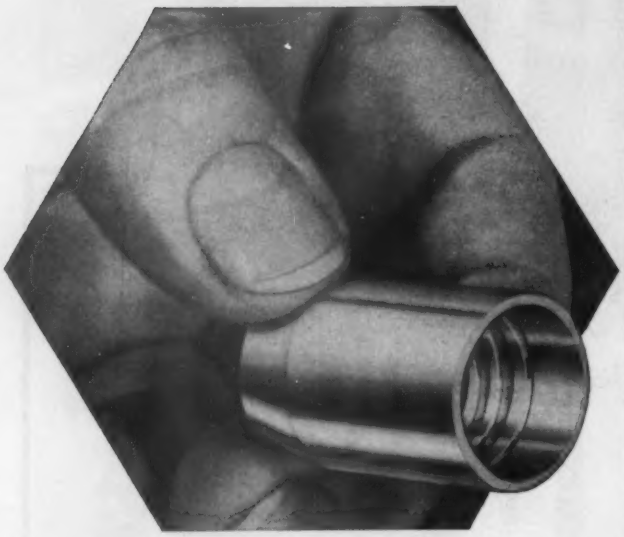

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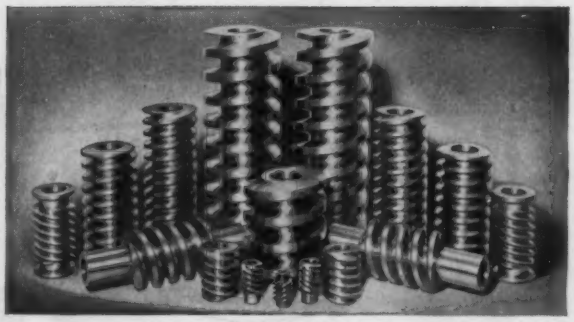

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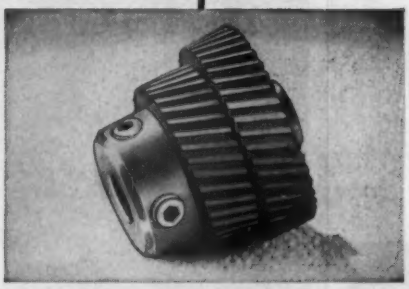
See How



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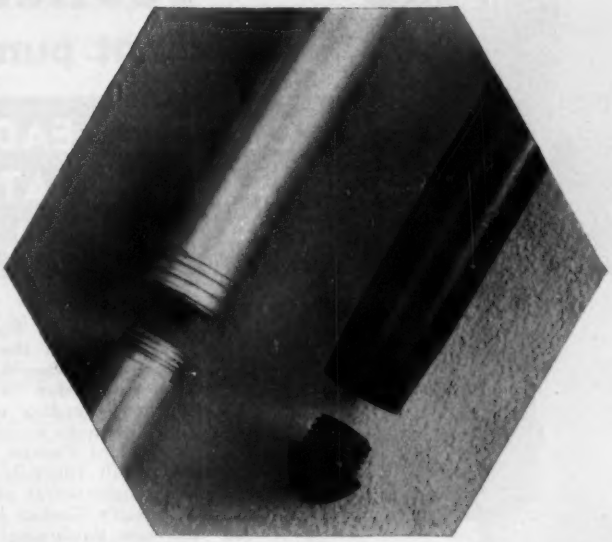

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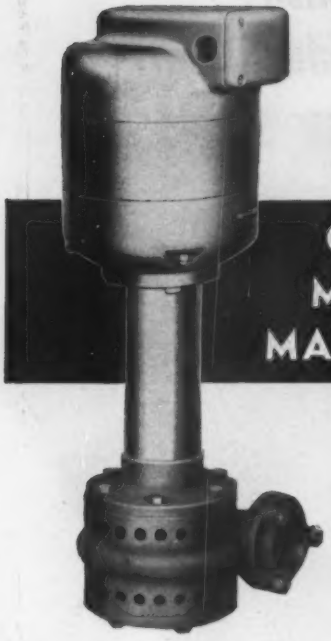

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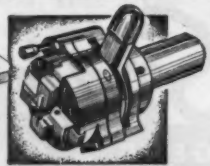

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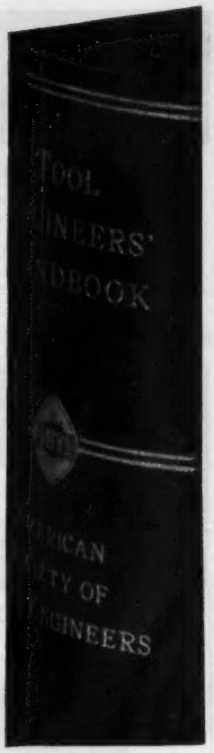

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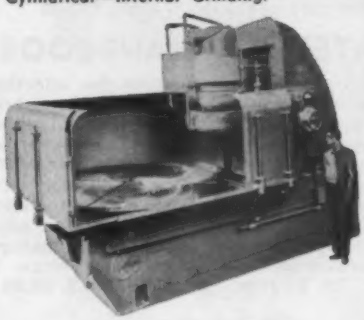

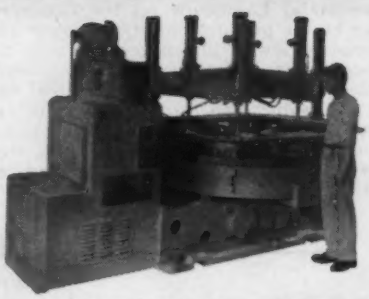

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BARNES No. 172 Honing; M.D., hydr.; late type
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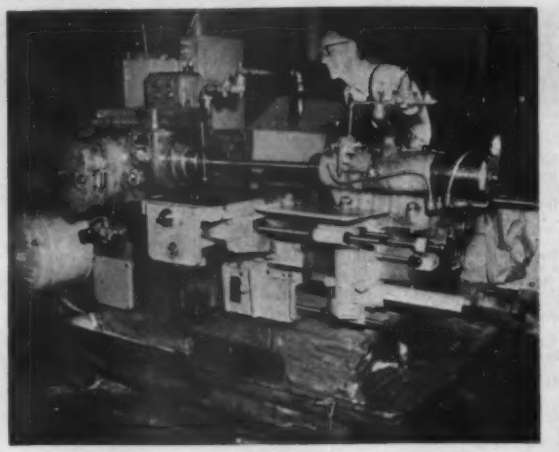

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100" Niles Vertical Boring Mill
Foote-Burt Vert., 5" dia. spdl., 26" sw. (1941)

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1 spdl-24" sw. No. 2MA-6 Avey, pow. fd.
1 spdl-26" sw. No. 4 MS Leland-Gifford (hyd.)
2 spdl-24" sw. No. 3 Avey
3 spdl-24" sw. No. 2MS Allen. Tap & B.G. (1942)
4 spdl 14" sw. No. 2LMS Leland-Gifford
4 spdl-26" sw. No. 2LMS Leland-Gifford, back gears
6 spdl-26" sw. No. 2LMS Leland-Gifford, Tap & B.G.
6 spdl-30" sw. No. 3B Edlund (1942)
16 spdl-K60H Fox Multiple, 15 HP (1944)

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11" Gleason Gear Generator
No. 36BM Gould & Eberhardt
No. 615A Fellows Gear Shaper
No. 612A Fellows Gear Shaper
No. 65 Fellows, Cone Drive
No. 12HS Gould & Eberhardt

GRINDERS
No. 4H, 4"x12" Landis Plain Cylindrical
5"x30" Norton Cam-O-Matic (1946)
5"x42" Norton Type C Cam-O-Matic (1944)
6"x18" Norton Type C Plain (1942)
10"x18" Norton Type C (1941)
10"x36" Norton Type C Plain
10"x36" Norton Type C Cam Grinder
10"x48" Norton Type C Plain (1943)
14"x48" Landis Type C Plain
14"x48" Landis Universal
18"x36" Cincinnati Model ER Univ. (1942)
14"-26"x72" Norton Plain
18"x120" Norton Type A Plain
20"x96" Norton Plain
20"x32"x144" Norton Gap
20"x102" Norton Type A Plain
24"x261" Norton Type A Plain
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10"x72" centers
10"x96" centers
14"x36" centers
14"x50" centers
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18"x96" centers
22"x96" centers
No. TG615 J. & L. Thread Grinder
No. 81 Heald Internal Centerless
No. 74 Heald Internal Centerless
No. 72A3 Heald Univ. Internal
No. 72A5 Heald Internal (1942)
No. 72A5 Heald Bridge Type Internal
No. 5 Bryant Internal
No. 5A Bryant Hole & Face
No. 5B Bryant Internal
No. 16-16 Bryant Internal
No. 16A16 Bryant
No. 16-28 Bryant Internal
No. 16A28 Bryant Internal
No. 16F28 Bryant Internal
No. 16-38 Bryant Internal
No. 24-26 Bryant Internal
No. 24-36 Bryant Internal
No. 24L36 Bryant Internal
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No. B24, 25" Chuck Arter Surface
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12"x21" Fay Automatic
16"x21" Fay Automatic (1944)
16"x33" R-14 Seneca Falls
16 ML 16 LeBlond Semi-Automatic
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27"x84" cc Amer. Geared Head M.D.
36"x126" cc Putnam Grd. Hd. M.D.
No. 2 W. & S. Geared Head
No. 5W Acme Universal
No. 7A Jones & Lamson (1942)
No. 1A Warner & Swasey
No. 2A Warner & Swasey (1942)
No. 3AL Gisholt Cross Slide Tur.
No. 3H-10 Libby International
No. 4A Warner & Swasey M.D.
No. 4A Warner & Swasey (1944)
No. 4FU Fastermatics, Tur. Type

MILLING MACHINES
No. 36 Van Norman Pl., Swivel Hd. (1941)
No. 4 Cinni. Dial Type Plain (1942)
118 Van Norman Hyd. Mfg. (1942)
No. 08 Cincinnati Vertical (1942)
Briggs Mfg. Mill, 30"x8" Table M.D. (1942)
54"x30"x16' Ingersoll Slab
10"x60" Pratt & Whitney Thread
12"x102" HT Lees-Bradner Thread
Model CT Lees-Bradner, 12" spdl. hole (1942)

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No. 7 BARDONS & OLIVER Universal Turret Lathe, 2½" capacity. Preselector Head.

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No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D., Late.

3" UNIVERSAL Horizontal, Boring, Milling, Drilling Machine. Table Type Oil Grooved Table 32½" x 58"; 12 spindle speeds 16 to 650 RPM; 72" cap. to end support. M.D. Late Type.

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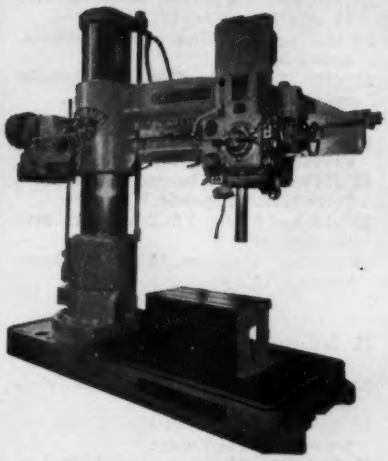

6' ARM x 19" COL. CARLTON RADIAL DRILL, 20 HP., LATE TYPE, 1943

No. 262 BARNES Motor Driven Sliding Drill Press, 2" cap. in steel, 1941.

No. 2 M. T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type.

400 tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support M.D.

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No. 5 NIAGARA O.B.I. Press, M.D.

No. 6 FEDERAL O.B.I. Press, 65 tons, cap., single geared, 4" stroke, M.D.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

36" ROCKFORD Hydraulic Openside Shaper, with Side Head, Late Type.

No. 20 WATERBURY FARREL Thread Roller, ⅜" cap. 1944, Motor Driven.

No. 8LS FELLOWS M.D. Gear Lapping Machine. Detachable Head, Univ. Work Support.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine. M.D. Late type.

10"x10" RACINE #30-C Hydraulic Heavy Duty Shear Cut Power Hack Saw, 1946.

10' x ¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

GRINDERS

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4" x 6" LMS TOOL GRINDER, M.D., Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D.

6" x 18' LANDIS Type "C" M.D. Hyd. Cylindrical Grinder. Serial #29196.

#TG848 JONES & LAMSON Thread Grinder, Lathe, M.D.

No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

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14" Fay Flanders Type, m.d.
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Model B—1-1/16" Cleveland, m.d.
Model A—1⅜" Cleveland Single Spindle, late
4 spindle 1⅜" Cleveland Model M, m.d.
No. 5 DELX Potter & Johnston, m.d., late
No. 6 DRELX Potter & Johnston, m.d., later type
2½" Cleveland, m.d., Model A
2" Cleveland Model A, single spindle, m.d.

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1" Landis Double Spindle, m.d. thru gear box
1½" Landis 2 spindle, late
1½" Landis 2 spindle, older type
1½" Landis Stay Bolt Threading Machine, Double Head, m.d.
No. 328 Oster Bolt & Pipe Threading Machine, m.d.

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#7 Barrett Horizontal Boring Machine
5" Universal Horizontal Boring Mill, m.d.
No. 25T Giddings & Lewis, m.d., late
No. 32 Lucas, m.d.
Barrett Double End, 7" and 5" spindles, m.d.
5" bar Ohio Table Type, m.d.
5½" bar Betts Floor Type, m.d.
5½" bar Niles-Bement-Pond, m.d.
6" bar Newton No. 2 Cylinder Borer, m.d.
10" bar Sellers Floor Type, m.d.
Natco Horiz. Drill, with 2 spindles on one end, m.d., late
Floor Plates—all sizes

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42" Bullard Spiral Drive, m.d., 1942
42" Bullard New Era, m.d.
42" King with side head and plain swivel head on rail, 1940
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44" Niles, m.d., p.r.t.
48" Niles-Bement-Pond Car Wheel Borer, md.
53" Niles Heavy Pattern, m.d., p.r.t.
73" Niles, m.d.
106" Niles Heavy, m.d., p.r.t
102" Niles Wheel Turning Boring Mill
12' Niles, m.d., p.r.t.

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Type SRD-49-15 American Vertical Dual Ram Surface Hydr Broach
Oilgear Hydraulic Broach, type XA, 54" stroke, m.d.
Type 3L8 LaPointe Horiz. Hydraulic, m.d.

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2½'-10" col. American Triple Purpose, m.d.
3'-9" col. Cincinnati Bickford, m.d.
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5'-14" col. Carlton, m.d.
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8'-17" col. American, Triple Purpose
8'-17" col. Dreses, gear box m.d.
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Baush Radial Drilling & Tapping Machine, m.d.

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No. 4 Foodick, 8" overhang, High Speed, m.d.
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No. 18 Canedy Otto Bench Model, m.d.
No. ½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 2 Avey Single Spindle, m.d.
2 spindle Allen, belted m.d., 8" overhang
No. 2LMS Leland-Gifford, single spindle, High speed, m.d.
2 spindle Avey, size No. 1, type B, style VHP, m.d., 8" overhang
2 spindle No. 3MA6 Avey High Speed, m.d.
3 spindle No. 2MA6 Avey High Speed, m.d.
2 spindle No. 2 Leland & Gifford High Speed, 8" overhang, m.d.
3 spindle Leland & Gifford #1LMS—High Speed, late, m.d.
3 spindle Leland & Gifford High Speed, Model 3MS, m.d.
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No. ½Bx30" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
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No. 1Bx74" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. 1½x105" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, m.d.
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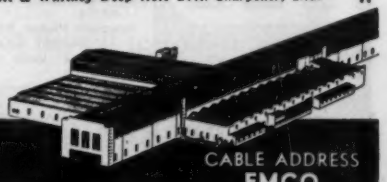

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42" Bullard Spiral Drive, new 1944

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7'16" column American Triple Purpose
10'22" column American Triple Purpose, gear box on arm

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36-H Gould & Eberhardt Hobber, single pulley drive, assortment of gears

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#3 Cincinnati, plain bearing

GRINDERS, Cylindrical

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16"x96" Cincinnati plain, 18" gap, mechanical feed, filmatic bearing

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30"x12' American, 3 SCD, 6' centers
30"x14' American G.H., 12 spindle speeds, 96" center distance
42"x14' American Internal Face Plate Drive G.H., 16 speeds, 7' centers
25"x18' bed Sidney 3 SCD lathe, 12' center distance
36"x18' bed American, 12 speeds, center distance 12'.

LATHES, Turret

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#2 Warner & Swasey, two speed motor, late type, bar feed
5R Acme ram type, late type, 2" bar capacity, hardened ways
1L Gisholt saddle type, new 1943, bar feed
4A Warner & Swasey saddle type, 9" hole in spindle, late type

MILLERS, Plain

2K Milwaukee Plain, late type, timken
3 Cincinnati Hi Power, single pulley
#4 Cincinnati Hi Power, single pulley
#5 Cincinnati Hi Power, timken bearing, rectangular overarm

MILLERS, Vertical

3-V Van Norman, late type, 18 speeds
3K Kearney & Trecker, late type
#4 Cincinnati, timken bearing
#4 Kempsmith, single pulley, stationary head, 18 spindle speed

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1404 K&T Prod Mill, 1943
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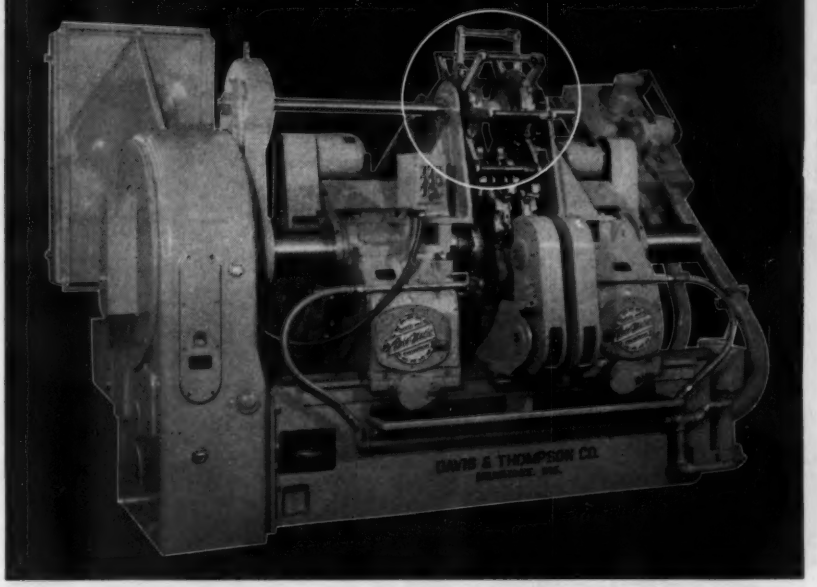

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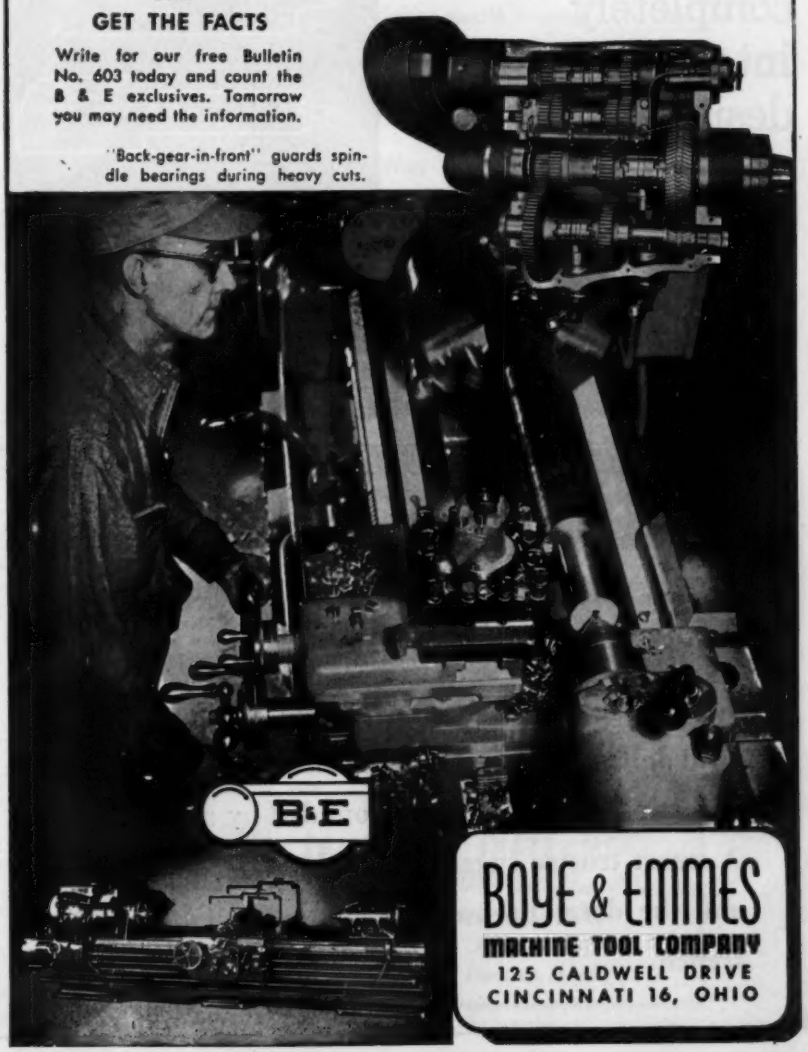

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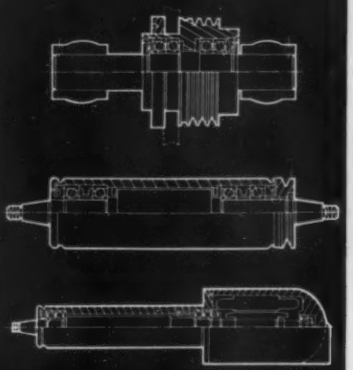

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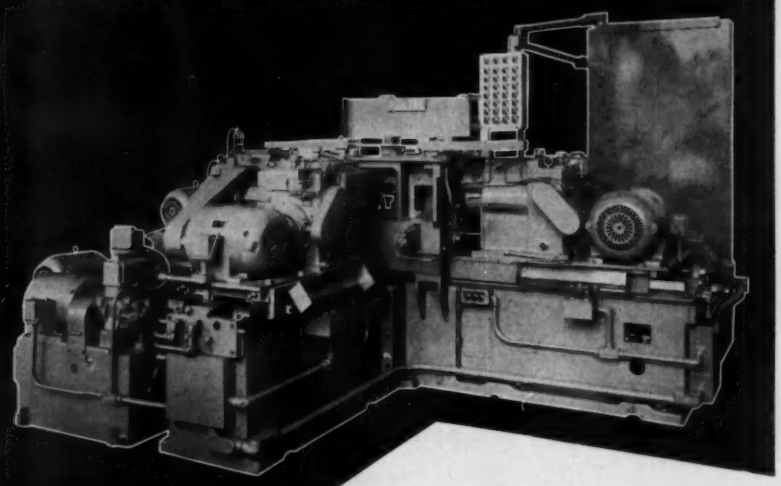

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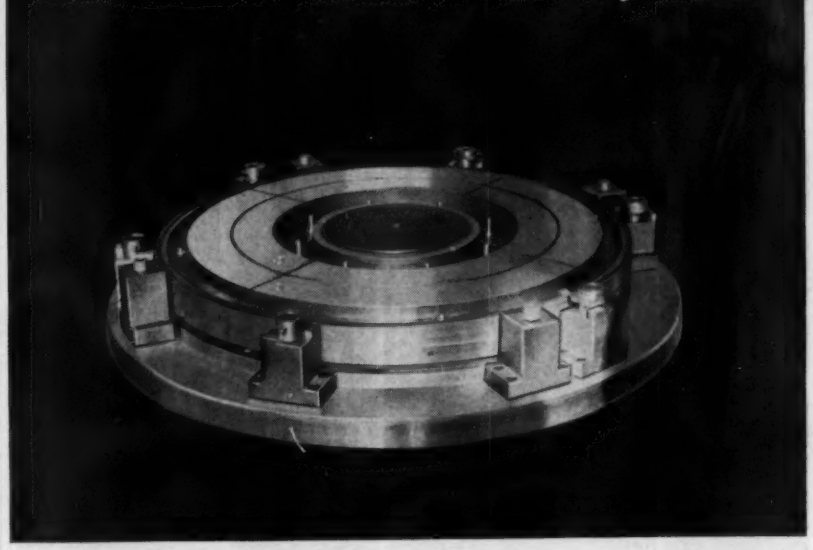

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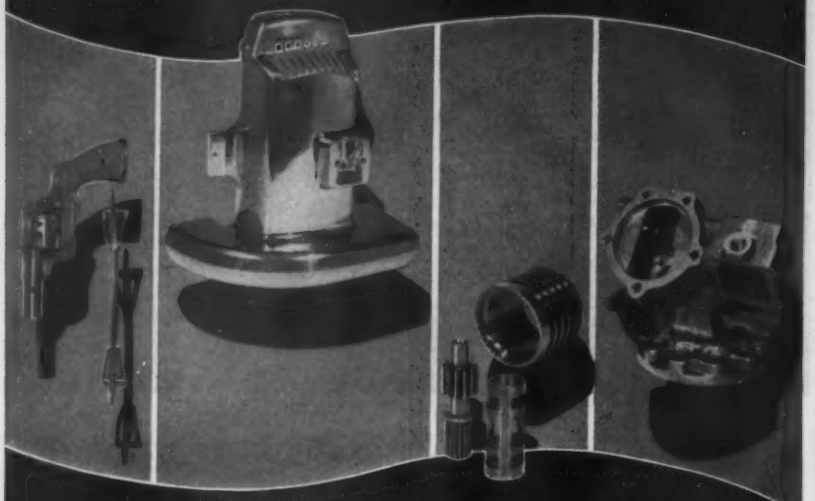

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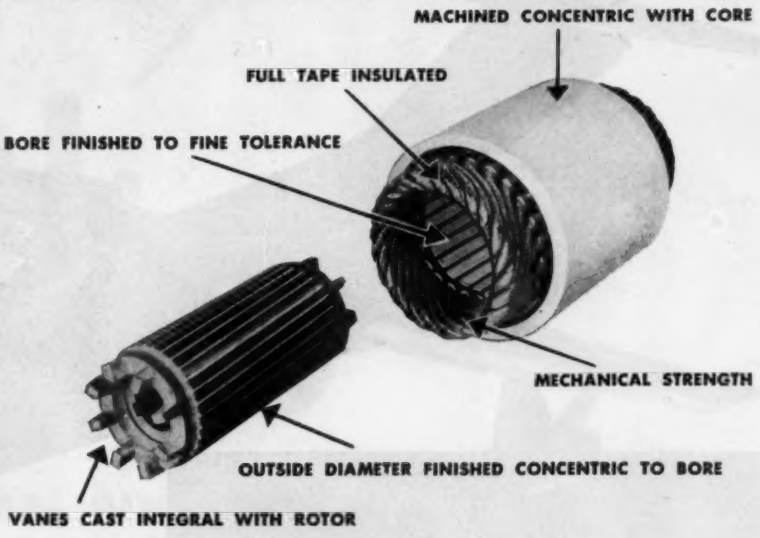
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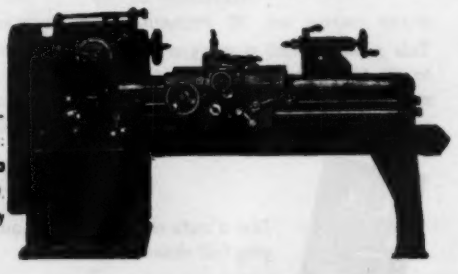

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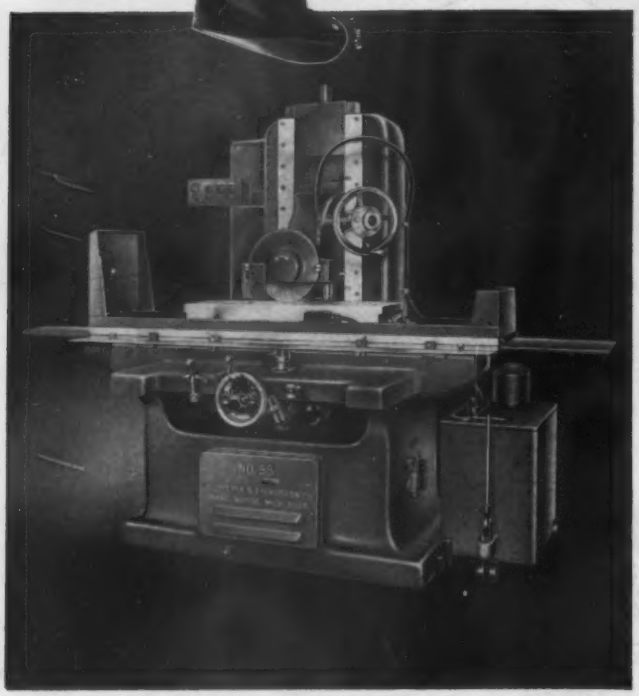

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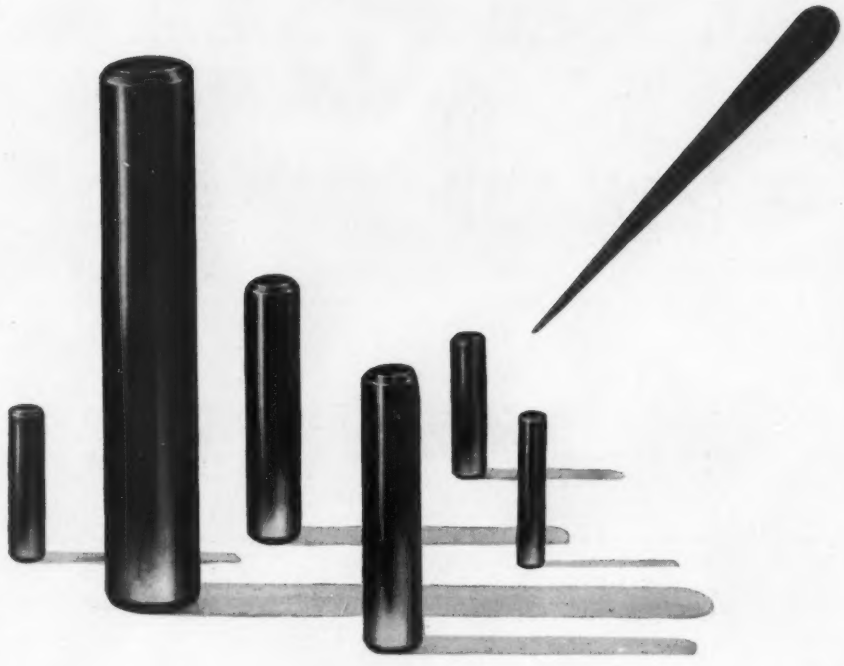

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HOLO-KROME SCREW CORP. • HARTFORD 10, CONN., U.S.A.

Grinds breech of 4,000 lb. gun barrel

TIMKEN® bearings on work spindle hold runout within .0007"

THIS Bryant Internal Grinder does parallel and tapered grinding jobs —often to a depth of 48"—in the breech end of 4,000 pound gun barrels. To give high accuracy and stability under heavy loads, the huge work spindle is mounted on Timken® tapered roller bearings having a 24" bore and 32" O.D.

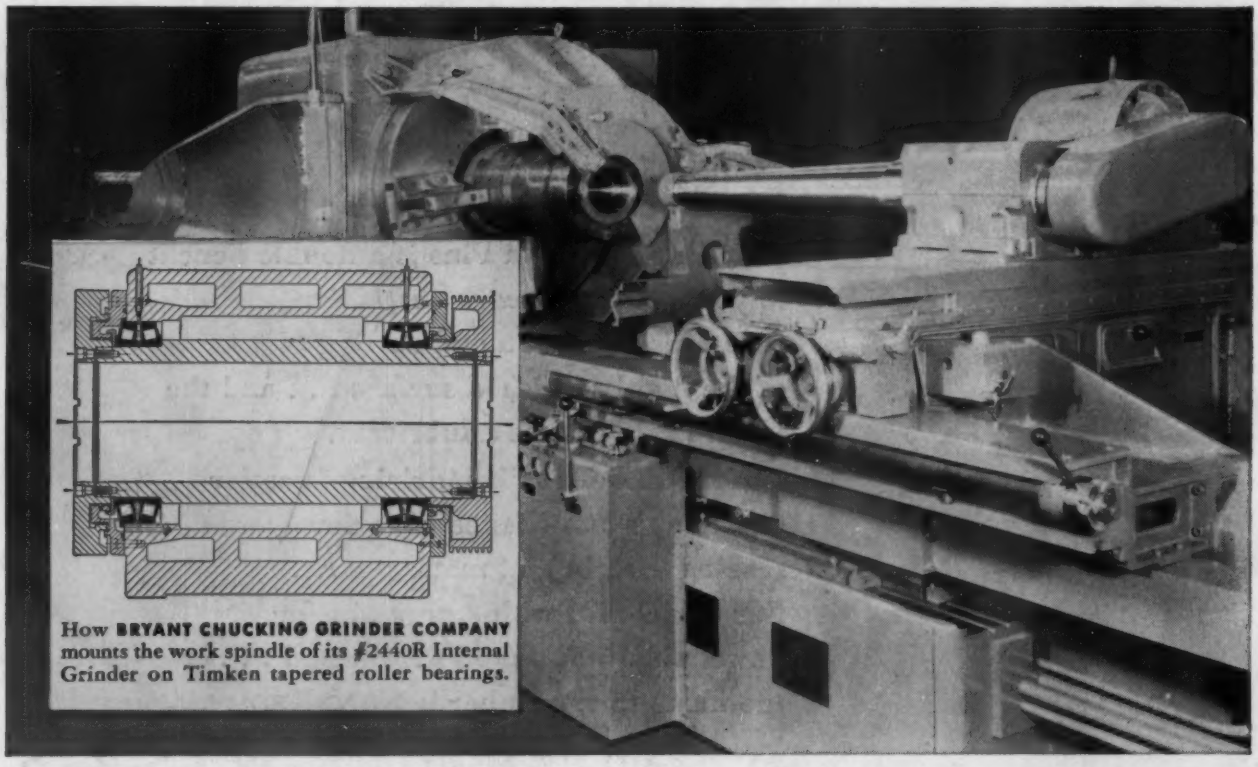
Due to their tapered construction, Timken bearings take radial and thrust loads in any combination. Spindles are held rigid, runout doesn't exceed .0007". And because of line contact between the rollers and races, Timken bearings have capacity to spare.

Both Timken bearings on the work spindle are mounted with cone spacers so that no manual adjustment is necessary. Spindle maintenance is simplified. And Timken bearings practically eliminate friction because they are geometrically designed to have true rolling motion and precision manufactured to live up to their design.

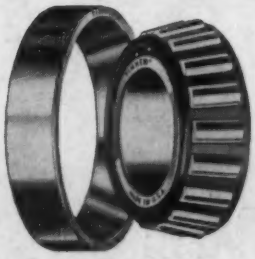
The end of the work spindle may possibly be bumped by the long, heavy gun tube when chucking a new piece. Timken bearings stand up to these shock loads because the rollers and races are case-hardened. This gives them hard, wear-resistant surfaces over tough, shock-resistant cores. What's more, we make our own steel to check quality every step of the way. No other U. S. bearing maker does.

Specify Timken bearings for the machinery you build or buy. Always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **BRYANT CHUCKING GRINDER COMPANY** mounts the work spindle of its #2440R Internal Grinder on Timken tapered roller bearings.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

MAGNIFYING GLASS INSPECTION OF EVERY ROLLER!

Every one of the over one billion Timken bearing rollers produced every year is inspected with powerful magnifying glasses to detect surface flaws. It's just one example of how the Timken Company insures uniform high quality.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ↓ AND THRUST →○← LOADS OR ANY COMBINATION →✳←